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DEPARTMENT OF ENERGY

10 CFR Parts 429 and 430

[EERE-2013-BT-TP-0050]

RIN 1904-AD88

Energy Conservation Program: Test Procedure for Ceiling Fans

AGENCY: Office of Energy Efficiency and Renewable Energy, Department of Energy.

ACTION: Supplemental notice of proposed rulemaking and request for comment.

SUMMARY: The U.S. Department of Energy ("DOE") proposes to amend the test procedures for ceiling fans. DOE initially presented proposed amendments in a notice of proposed rulemaking ("NOPR") published on September 30, 2019. DOE is publishing this supplemental notice of proposed rulemaking ("SNOPR") to present modifications to certain proposals presented in the NOPR, and to propose additional amendments. In this SNOPR, DOE proposes to include a definition for "circulating air" for the purpose of the ceiling fan definition, include ceiling fans greater than 24 feet in the scope, include certain belt-driven ceiling fans within scope, include a standby metric for large-diameter ceiling fans, amend the low speed definition, permit an alternate set-up to collect air velocity test data, amend certain set-up and operation specifications, amend the blade thickness measurement requirement, and update product-specific rounding and enforcement provisions. DOE is seeking comment from interested parties on the proposal.

DATES: DOE will accept comments, data, and information regarding this proposal no later than **[INSERT DATE 60 DAYS AFTER DATE OF PUBLICATION IN THE *FEDERAL REGISTER*]**. See section V, "Public Participation," for details. DOE will hold a webinar on Tuesday, January 11, 2022, from 12:30 p.m. to 3:30 p.m. E.S.T. See section V, "Public Participation," for webinar registration information, participant instructions, and information about the capabilities available to webinar participants. If no participants register for the webinar, it will be cancelled.

ADDRESSES: Interested persons are encouraged to submit comments using the Federal eRulemaking Portal at *www.regulations.gov*. Follow the instructions for submitting comments. Alternatively, interested persons may submit comments, identified by docket number EERE–2013–BT–TP-0050, by any of the following methods:

1. *Federal eRulemaking Portal*: *www.regulations.gov*. Follow the instructions for submitting comments.
2. *E-mail*: *CF2013TP0050@ee.doe.gov*. Include the docket number EERE–2013–BT–TP-0050 or regulatory information number ("RIN") 1904-AD88 in the subject line of the message.

No telefacsimilies ("faxes") will be accepted. For detailed instructions on submitting comments and additional information on this process, see section V of this document.

Although DOE has routinely accepted public comment submissions through a variety of mechanisms, including the Federal eRulemaking Portal, email, postal mail, or hand delivery/courier, the Department has found it necessary to make temporary modifications to the comment submission process in light of the ongoing Covid-19

pandemic. DOE is currently suspending receipt of public comments via postal mail and hand delivery/courier. If a commenter finds that this change poses an undue hardship, please contact Appliance Standards Program staff at (202) 586-1445 to discuss the need for alternative arrangements. Once the Covid-19 pandemic health emergency is resolved, DOE anticipates resuming all of its regular options for public comment submission, including postal mail and hand delivery/courier.

Docket: The docket, which includes *Federal Register* notices, webinar attendee lists and transcripts (if a webinar is held), comments, and other supporting documents/materials, is available for review at *www.regulations.gov*. All documents in the docket are listed in the *www.regulations.gov* index. However, some documents listed in the index, such as those containing information that is exempt from public disclosure, may not be publicly available.

The docket web page can be found at *regulations.gov/docket/EERE-2013-BT-TP-0050*. The docket web page contains instructions on how to access all documents, including public comments, in the docket. See section V for information on how to submit comments through *www.regulations.gov*.

FOR FURTHER INFORMATION CONTACT:

Mr. Jeremy Dommu, U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, Building Technologies Office, EE-2J, 1000 Independence Avenue, SW., Washington, DC, 20585-0121. Telephone: (202) 586-9870. E-mail *ApplianceStandardsQuestions@ee.doe.gov*.

Ms. Amelia Whiting, U.S. Department of Energy, Office of the General Counsel, GC-33, 1000 Independence Avenue, SW., Washington, DC, 20585-0121. Telephone: (202) 586-9870. E-mail: *ApplianceStandardsQuestions@ee.doe.gov*.

For further information on how to submit a comment, review other public comments and the docket, or participate in a public meeting (if one is held), contact the Appliance and Equipment Standards Program staff at (202) 287-1445 or by e-mail: *ApplianceStandardsQuestions@ee.doe.gov*.

DOE has submitted the collection of information contained in the proposed rule to OMB for review under the Paperwork Reduction Act, as amended. (44 U.S.C. 3507d)) Comments on the information collection proposal shall be directed to the Office of Information and Regulatory Affairs, Office of Management and Budget, Attention: Sofie Miller, OIRA Desk Officer by e-mail: *sofie.e.miller@omb.eop.gov*.

SUPPLEMENTARY INFORMATION:

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I. Authority and Background

DOE is authorized to establish and amend energy conservation standards and test procedures for ceiling fans. (42 U.S.C. 6293(b)(16)(A)(i) and (B), and 42 U.S.C. 6295(ff)) DOE's energy conservation standards and test procedures for ceiling fans are currently prescribed at title 10 of the Code of Federal Regulations ("CFR"), part 430 section 32(s)(1) and (2), 10 CFR part 430 section 23(w), and 10 CFR part 430 subpart B appendix U ("Appendix U"). The following sections discuss DOE's authority to establish test procedures for ceiling fans and relevant background information regarding DOE's consideration of test procedures for this product.

A. Authority

The Energy Policy and Conservation Act, as amended ("EPCA"),[1] authorizes DOE to regulate the energy efficiency of a number of consumer products and certain industrial equipment. (42 U.S.C. 6291–6317) Title III, Part B[2] of EPCA established the Energy Conservation Program for Consumer Products Other Than Automobiles, which sets forth a variety of provisions designed to improve energy efficiency. These products include ceiling fans, the subject of this document. (42 U.S.C. 6291(49), 42 U.S.C. 6293(b)(16)(A)(i) and (B), and 42 U.S.C. 6295(ff))

The energy conservation program under EPCA consists essentially of four parts: (1) testing, (2) labeling, (3) Federal energy conservation standards, and (4) certification and enforcement procedures. Relevant provisions of EPCA specifically include definitions (42 U.S.C. 6291), test procedures (42 U.S.C. 6293), labeling provisions (42 U.S.C. 6294), energy conservation standards (42 U.S.C. 6295), and the authority to require information and reports from manufacturers (42 U.S.C. 6296).

The Federal testing requirements consist of test procedures that manufacturers of covered products must use as the basis for: (1) certifying to DOE that their products comply with the applicable energy conservation standards adopted pursuant to EPCA (42 U.S.C. 6295(s)), and (2) making representations about the efficiency of those consumer products (42 U.S.C. 6293(c)). Similarly, DOE must use these test procedures to

[1] All references to EPCA in this document refer to the statute as amended through the Energy Act of 2020, Pub. L. 116-260 (Dec. 27, 2020).
[2] For editorial reasons, upon codification in the U.S. Code, Part B was redesignated Part A.

determine whether the products comply with relevant standards promulgated under EPCA. (42 U.S.C. 6295(s))

Federal energy efficiency requirements for covered products established under EPCA generally supersede State laws and regulations concerning energy conservation testing, labeling, and standards. (42 U.S.C. 6297) DOE may, however, grant waivers of Federal preemption for particular State laws or regulations, in accordance with the procedures and other provisions of EPCA. (42 U.S.C. 6297(d))

Under 42 U.S.C. 6293, EPCA sets forth the criteria and procedures DOE must follow when prescribing or amending test procedures for covered products. EPCA requires that any test procedures prescribed or amended under this section be reasonably designed to produce test results which measure energy efficiency, energy use or estimated annual operating cost of a covered product during a representative average use cycle or period of use and not be unduly burdensome to conduct. (42 U.S.C. 6293(b)(3))

In addition, EPCA requires that DOE amend its test procedures for all covered products to integrate measures of standby mode and off mode energy consumption. (42 U.S.C. 6295(gg)(2)(A)) Standby mode and off mode energy consumption must be incorporated into the overall energy efficiency, energy consumption, or other energy descriptor for each covered product unless the current test procedures already account for and incorporate standby and off mode energy consumption or such integration is technically infeasible. If an integrated test procedure is technically infeasible, DOE must prescribe a separate standby mode and off mode energy use test procedure for the covered product, if technically feasible. (42 U.S.C. 6295(gg)(2)(A)) Any such amendment must consider the most current versions of the International Electrotechnical

Commission ("IEC") Standard 62301[3] and IEC Standard 62087[4] as applicable. (42 U.S.C. 6295(gg)(2)(A))

With respect to ceiling fans, EPCA requires that test procedures be based on the "Energy Star Testing Facility Guidance Manual: Building a Testing Facility and Performing the Solid State Test Method for ENERGY STAR Qualified Ceiling Fans, Version 1.1" published by the Environmental Protection Agency, and that the Secretary may review and revise the test procedures established. (42 U.S.C. 6293(b)(16)(A)(i) and (B))

EPCA also requires that, at least once every 7 years, DOE evaluate test procedures for each type of covered product, including ceiling fans, to determine whether amended test procedures would more accurately or fully comply with the requirements for the test procedures to not be unduly burdensome to conduct and be reasonably designed to produce test results that reflect energy efficiency, energy use, and estimated operating costs during a representative average use cycle or period of use. (42 U.S.C. 6293(b)(1)(A))

If the Secretary determines, on her own behalf or in response to a petition by any interested person, that a test procedure should be prescribed or amended, the Secretary shall promptly publish in the *Federal Register* proposed test procedures and afford interested persons an opportunity to present oral and written data, views, and arguments with respect to such procedures. The comment period on a proposed rule to amend a test procedure shall be at least 60 days and may not exceed 270 days. In

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[3] IEC 62301, *Household electrical appliances—Measurement of standby power* (Edition 2.0, 2011-01).
[4] IEC 62087, *Methods of measurement for the power consumption of audio, video, and related equipment* (Edition 3.0, 2011-04).

prescribing or amending a test procedure, the Secretary shall take into account such information as the Secretary determines relevant to such procedure, including technological developments relating to energy use or energy efficiency of the type (or class) of covered products involved. (42 U.S.C. 6293(b)(2)). If DOE determines that test procedure revisions are not appropriate, DOE must publish its determination not to amend the test procedures. (42 U.S.C. 6293(b)(1)(A)(ii)) DOE is publishing this SNOPR pursuant to the 7-year review requirement specified in EPCA.

B. Background

As stated, DOE's existing test procedures for ceiling fans appear at Appendix U. DOE published a final rule in the *Federal Register* on July 25, 2016 ("July 2016 Final Rule"), which amended the test procedures for ceiling fans at Appendix U. 81 FR 48620, 48622. On September 30, 2019, DOE published a NOPR ("September 2019 NOPR") proposing amendments to the test procedure addressing questions received from interested parties. 84 FR 51440. In the September 2019 NOPR, DOE proposed to interpret the term "suspended from a ceiling" in the EPCA definition of ceiling fan to mean offered for mounting only on a ceiling; specify that very small-diameter ("VSD") ceiling fans that do not also meet the definition of low-speed small-diameter ("LSSD") ceiling fan are not required to be tested pursuant to the DOE test method; for LSSD and VSD ceiling fans, increase the tolerance for the stability criteria for the average air velocity measurements during low speed tests; specify that large-diameter ceiling fans with blade spans greater than 24 feet do not need to be tested pursuant to the DOE test method; codify current guidance on calculating several values reported on the U.S. Federal Trade Commission's ("FTC") EnergyGuide label for LSSD and VSD ceiling fans; and amend certification requirements and product-specific enforcement provisions

to reflect the current test procedures and recently amended energy conservation standards for ceiling fans. 84 FR 51440, 51442. Additionally, on October 17, 2019, DOE hosted a public meeting to present the September 2019 NOPR proposals.

Table I.1 lists a subset of comments received by DOE in response to the September 2019 NOPR that are relevant to this SNOPR.

Table I.1 Subset of Comments Received in Response to September 2019 NOPR that are Relevant to this SNOPR

Commenter(s)	Reference in this SNOPR	Commenter Type
Air Movement and Control Association International*	AMCA	Trade Association
American Lighting Association	ALA	Trade Association
Anonymous	Anonymous	Individual Commenter
Big Ass Fans	BAF	Manufacturer
Chris Ransom	Ransom	Individual Commenter
Hunter Fan Company	Hunter	Manufacturer
Pacific Gas and Electric Company, San Diego Gas and Electric, and Southern California Edison	CA IOUs	Utilities

*DOE received two separate comment submissions from AMCA; however, the second comment replaced the first. See comment number 33 in the docket (replacing comment number 30).

A parenthetical reference at the end of a comment quotation or paraphrase provides the location of the item in the public record.[5] This SNOPR only discusses a subset of topics under consideration as part of this test procedure rulemaking and not all comments received in response to the September 2019 NOPR are addressed in this SNOPR. Comments not addressed in this SNOPR will be addressed in the next stages of the rulemaking.

[5] The parenthetical reference provides a reference for information located in the docket of DOE's rulemaking to develop test procedures for ceiling fans. (Docket No. EERE-2013-BT-TP-0050, which is maintained at *www.regulations.gov/docket/EERE-2013-BT-TP-0050*). The references are arranged as follows: (commenter name, comment docket ID number, page of that document).

DOE, with the support of the ALA, conducted a round robin test program for ceiling fans to observe laboratory setups and test practices, evaluate within-laboratory variation (*i.e.*, repeatability) and assess between-laboratory consistency (*i.e.*, reproducibility). Round robin testing was conducted from January 2019 to April 2020. Six test laboratories participated in the round robin, representing both manufacturer laboratories and third-party laboratories. Four laboratories are located in North America, and two are located in China. ALA and ceiling fan manufacturers supplied two samples each of five ceiling fan models (for a total of 10 test samples). The laboratories were instructed to test according to appendix U. DOE representatives were present during all testing to observe test setups and practices used in a variety of labs. In this SNOPR, DOE includes several proposals based on test results and observations made during round robin testing. The round robin test report has been separately published in the docket.[6]

On May 27, 2021, DOE published a final rule to amend the current regulations for large-diameter ceiling fans. 86 FR 28469 ("May 2021 Technical Amendment") The contents of these technical amendments correspond with provisions enacted by Congress through the Energy Act of 2020. *Id.* Specifically, section 1008 of the Energy Act of 2020 amended section 325(ff)(6) of EPCA to specify that large-diameter ceiling fans manufactured on or after January 21, 2020, are not required to meet minimum ceiling fan efficiency requirements in terms of the ratio of the total airflow to the total power consumption as established in a final rule published January 19, 2017 (82 FR 6826; "January 2017 Final Rule"), and instead are required to meet specified minimum efficiency requirements based on the Ceiling Fan Energy Index ("CFEI") metric. 86 FR 28469, 28469-28470. The May 2021 Technical Amendment also implemented

[6] The docketed round robin report can be found in the rulemaking docket EERE-2013-BT-TP-0050. *www.regulations.gov/docket/EERE-2013-BT-TP-0050*

conforming amendments to the ceiling fan test procedure to ensure consistency with the Energy Act of 2020. 86 FR 28469, 28470.

On May 7, 2021, DOE published an early assessment request for information (RFI) undertaking an early assessment review for amended energy conservation standards for ceiling fans to determine whether to amend applicable energy conservation standards for this product. 86 FR 24538 ("May 2021 RFI").

II. Synopsis of the Notice of Proposed Rulemaking

In this SNOPR, DOE proposes to update appendix U as follows:

1) Specify that for the purpose of the ceiling fan definition, "circulating air" means the discharge of air in an upward or downward direction with the air returning to the intake side of the fan. A ceiling fan that has a ratio of fan blade span (in inches) to maximum rotation rate (in revolutions per minute) greater than 0.06 provides circulating air;

2) Extend the scope of the test procedure to include large diameter fans with a diameter greater than 24 feet;

3) Include high-speed belt-driven and large-diameter belt-driven ceiling fans within scope;

4) Add a standby power metric for large-diameter ceiling fans;

5) Modify the low-speed definition to ensure that LSSD ceiling fans (including VSD ceiling fans that also meet the definition of an LSSD fan) are tested at a more representative low speed rather than the currently required "lowest available ceiling fan speed";

6) Allow use of an alternative procedure for air velocity data collection that relies on a two-arm sensor arm setup, and require setups with arm rotation to stabilize the arm prior to data collection;

7) Clarify the alignment of air velocity sensor placement on the sensor arm(s);

8) Specify the instructions to measure blade thickness for LSSD and HSSD ceiling fan definitions;

9) Specify test procedures for ceiling fans with accessories and/or features; and

10) Amend product-specific rounding and enforcement provisions for ceiling fans.

Table II.1 summarizes DOE's proposed actions compared to the current test procedure, as well as the reason for the proposed change.

Table II.1 Summary of Changes in Proposed Test Procedure Relative to Current Test Procedure

Current DOE Test Procedure	NOPR Proposal	SNOPR Proposal	Attribution
Defines "ceiling fan" based on EPCA as "a nonportable device that is suspended from a ceiling for circulating air via the rotation of fan blades."	Interpreted the EPCA definition of ceiling fan to mean those fans offered for mounting only on a ceiling and seeks comment on a proposed alternative interpretation.	Defines the term "circulating air" for the purpose of the ceiling fan definition to mean "the discharge of air in an upward or downward direction with the air returning to the intake side of the fan. A ceiling fan that has a ratio of fan blade span (in inches) to maximum rotation rate (in revolutions per minute) greater than 0.06 provides circulating air."	Response to industry comments.
Excludes large diameter fans with a diameter of greater than 24 feet from the test procedure.	Specified that large-diameter ceiling with blade spans greater than 24 feet do not need to be tested pursuant to the DOE test method	Includes large diameter fans with a diameter of greater than 24 feet in the scope of the test procedure.	Response to industry comments.
Excludes all belt-driven ceiling fans from the test procedure.	N/A	Includes definitions and test procedures for high-speed belt-driven ceiling fans and large-diameter belt-driven ceiling fans.	Response to industry comments.
Includes a standby power test procedure, but no standby power metric for large-diameter ceiling fan CFEI metric. Prior to the Energy Act of 2020, the	N/A	Amends Appendix U to include a standby power metric for large-diameter ceiling fans.	42 U.S.C. 6295(gg)(2)(A) requires test procedures for all products to include standby mode and

Current DOE Test Procedure	NOPR Proposal	SNOPR Proposal	Attribution
CFM/W metric was applicable for large-diameter ceiling fans, which included standby power.			off mode energy consumption.
Defines "low speed" as "the lowest available ceiling fan speed, i.e., the fan speed corresponding to the minimum, non-zero, blade RPM."	No proposed updates, but requested comment on updating the definition of low speed to "as the lowest available ceiling fan speed for which fewer than half or three, whichever is fewer, sensors on any individual axis are measuring less than 30 feet per minute."	Defines "low speed" as the "lowest available ceiling fan speed for which fewer than half or three, whichever is fewer, sensors per individual axis are measuring less than 40 feet per minute." Alternatively, DOE is considering representing the proposed definition as a table instead, indicating the number of sensors that must measure > 40 FPM.	Improve the repeatability and reproducibility of the test procedure as determined during round robin testing.
Prescribes two setups, a four-arm and one-arm sensor setup for certain fan types.	N/A	Adds an alternative two-arm setup to measure air velocity. Further, adds requirement for setups that require arm rotation to stabilize the arm to dissipate any residual turbulence prior to data collection.	Improve the repeatability and reproducibility of the test procedure as determined during round robin testing.
Does not explicitly specify air velocity sensor alignment or acceptance angle.	N/A	Provides explicit instructions to align the air velocity sensors perpendicular to the airflow.	Improve the repeatability and reproducibility of the test procedure as determined during round robin testing.
Does not specify how fan blade thickness should be measured.	Added specification to measure fan blade thickness without consideration of "rolled-edge" blade design.	Adds specification to measure fan blade thickness in a consistent manner for all fan blade types (including "rolled-edge" blade designs).	Improve the repeatability and reproducibility of the test procedure.
Does not include specific instructions on how ceiling fan accessories and/or features should be incorporated into the test procedure.	N/A	Specifies that accessories/additional features should be turned off, when possible, before testing ceiling fans for active mode and standby mode.	Improve representativeness and reproducibility of the test procedure.
Does not include any measurement tolerances for blade RPM and blade edge thickness and any rounding requirement for represented values.	Included measurement tolerance of at least ± 0.1 inch for blade edge thickness; within the greater of 1% of the average RPM at high speed (rounded to the nearest RPM) or 1 RPM. Includes proposal that blade edge thickness be rounded to ±0.1 inch.	Updates measurement tolerances for blade RPM to 2% and blade edge thickness to ± 0.01 inch. Also updates rounding requirements for blade edge thickness to ± 0.01 inch. Includes new rounding proposal for airflow at high speed.	Include rounding and enforcement requirements for current standards.

Additionally, to provide interested parties with a complete set of proposed amendments, this SNOPR includes all proposed regulatory text for the proposals from the September 2019 NOPR and this SNOPR. DOE maintains the following proposals from

the September 2019 NOPR: (1) specifying that VSD ceiling fans that do not also meet the definition of LSSD fan are not required to be tested pursuant to the DOE test method for purposes of demonstrating compliance with DOE's energy conservation standards for ceiling fans or representations of efficiency; (2) increasing the tolerance for the stability criteria for the average air velocity measurements for LSSD and VSD ceiling fans that also meet the definition of LSSD fan; (3) codifying in regulation existing guidance on the method for calculating several values reported on the Federal Trade Commission (FTC) EnergyGuide label using results from the ceiling fan test procedures in Appendix U to subpart B of 10 CFR part 430 and represented values in 10 CFR part 429; and (4) amending product-specific represented values, rounding and enforcement provisions. 84 FR 51440, 51442. DOE continues to review and consider comments received on these proposals and will address such comments in a future stage of the rulemaking. DOE will be addressing certification and reporting requirements in a separate rulemaking.

DOE has tentatively determined that the proposed amendments described in section III of this SNOPR would not require re-testing for a majority of ceiling fans. The proposal to redefine low speed would require retesting for a limited number of LSSD ceiling fans, if made final. Discussion of DOE's proposed actions are addressed in detail in section III of this SNOPR, including test procedure costs and cost savings.

III. Discussion

A. Scope of Ceiling Fan Definition

The Energy Policy and Conservation Act defines "ceiling fan" as "a nonportable device that is suspended from a ceiling for circulating air via the rotation of fan blades." (42 U.S.C. 6291(49)) DOE codified the statutory definition in 10 CFR 430.2. In

the July 2016 Final Rule, DOE stated that the test procedure applies to any product meeting this definition, including hugger fans, fans designed for applications where large airflow volume may be needed, and highly decorative fans. 81 FR 48620, 48622. DOE stated, however, that manufacturers were not required to test the following fans according to the test procedure: belt-driven ceiling fans, centrifugal ceiling fans, oscillating ceiling fans, and ceiling fans whose blades' plane of rotation cannot be within 45 degrees of horizontal. *Id.*

In the September 2019 NOPR, DOE proposed to clarify its interpretation of the statutory definition in response to an inquiry from the AMCA regarding the application of the term "ceiling fan" to products known as "air circulating fan heads ("ACFHs")."[7] 84 FR 51440, 51443-51445. In letters submitted to DOE in May and July of 2019, AMCA asserted that air circulating fan heads have distinct characteristics and functions compared to traditional ceiling fans, including that air circulating fan heads provide concentrated directional airflow as opposed to circulating air.[8] (AMCA, No. 23 in *both May and July 2019 letters,* at p. 1) AMCA recommended that DOE use the physical characteristics of fan diameter and rotational tip speed or outlet air speed as a means to distinguish fans that circulate air (as necessary to meet the statutory definition of "ceiling fan") from ACFHs that provide directional air flow (*i.e.*, fans excluded from the statutory definition of "ceiling fan").[9] (AMCA, No. 23 *in the July 2019 letter* at p. 2)

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[7] Section 5.1.1 of ANSI/AMCA Standard 230–15 (''AMCA 230–15''), ''Laboratory Methods of Testing Air Circulating Fans for Rating and Certification,'' defines *air circulating fan head* as "an assembly consisting of a motor, impeller and guard for mounting on a pedestal having a base and column, wall mount bracket, ceiling mount bracket, I-beam bracket or other commonly accepted mounting means."

[8] The May and July 2019 letters are available at *www.regulations.gov/document?D=EERE-2013-BT-TP-0050-0023*.

[9] AMCA specifically recommended the use of tip speed, which is calculated as blade diameter x 3.14159 x rotational speed in RPM, and suggested that the maximum tip speed of a ceiling fan would be 4000 feet per minute. See May 2019 letter, page 2.

Accordingly, in the September 2019 NOPR, DOE proposed to clarify the definition of "ceiling fan" and proposed two alternate definitions of the term. The first proposed definition would provide additional direction to distinguish a "ceiling fan" from other fans based on the "non-portable" element and "suspended from a ceiling" (*i.e.*, "mounting") element of the statutory definition. 84 FR 51440, 51444. Specifically, DOE proposed to include within the definition that for purposes of the definition, the term "suspended from a ceiling" means offered for mounting on a ceiling, and the term "nonportable" means not offered for mounting on a surface other than a ceiling." *Id*.

The second proposed definition would specifically reference ACFHs and provide additional clarification on the mounting element. 84 FR 51440, 51444. Specifically, DOE proposed to include within the definition that any fan, including those meeting the definition of an "air circulating fan head" in AMCA 230-15, that does not have a ceiling mount option, or that has more than one mounting option (even if one of the mounting options is a ceiling mount), is not a ceiling fan. Such fans do not meet the statutory criteria of being "nonportable", "suspended from the ceiling", and "for the purpose of circulating air." 84 FR 51440, 51444-51445.

In addition to the alternate proposed definitions, DOE acknowledged AMCA's suggestion of using tip speed or outlet air speed to distinguish between ACFHs and ceiling fans, and requested comment and data on whether and how the test procedure could be amended to accommodate such a distinction. 84 FR 51440, 51445.

In response to the September 2019 NOPR, ALA explained that while the first option is better than the alternative definition, they opposed both options. ALA stated that the first alternate definition (distinguishing ceiling fans based on "non-portable" and

"mounting") is too broad, could create a loophole for ceiling fans to be exempt from the standards, and that unregulated ceiling fans as a result of this proposed definition would eventually overtake the market. ALA also stated that the second alternative definition (referencing ACFHs and "mounting") it is too narrow, and products that would be innovative or meet a specific need in the market could not be made or sold. (ALA, No. 34 at p. 2)

AMCA stated the proposal will provide excessive opportunity for currently regulated fans to escape regulation. Further, AMCA identified three large-diameter ceiling fan ("LDCF") manufacturers that offer or have offered ground-mounted LDCFs and suggested that with the proposed reinterpretation, LDCF manufacturers could chose to offer a floor-mount option for their products and be exempt from standards. AMCA also commented that the proposed definition of "portable" would open a significant loophole and explained that many LDCFs are not hardwired in place. (AMCA, No. 33 at pp. 2-3)

CA IOUs stated that DOE's proposed interpretation to only address fans offered for mounting on a ceiling in the September 2019 NOPR deviates from the scope of products established under the existing legislation and raises concerns of potential gaming to avoid product testing, as well as potential backsliding for products that would be newly exempted after being included in the previous test procedure iteration. (CA IOUs No. 31 at p. 2)

Hunter commented that further clarification and additional stipulations beyond those proposed by DOE would be required to prevent unwelcomed loopholes and alleviate the possibility of "gaming the system" to claim an exemption from testing.

(Hunter No. 29 at p. 2) Anonymous commented that the interpretations put forth in the NOPR limit the applicability to nonportable ceiling fans that are used to create air circulation, and recommended that the test procedures should apply to all fans, even portable ones that may plug into the wall, and are not necessarily for "air circulation". (Anonymous, No. 32 at p. 1)

As an alternative to DOE's proposal, multiple interested parties recommended that the definition of ceiling fan be based on, in part, a ratio of diameter to maximum operating speed. Specifically, these commenters suggested that a diameter-to-maximum operating speed ratio less than 0.06 inches/RPM could be used to distinguish products that are not ceiling fans, i.e. air circulating fan heads. (Hunter Fans, BAFs, Public Meeting Transcript at pp. 33-35, AMCA, No. 33 at pp. 3-6; ALA, No. 34 at p. 2; and Hunter No. 29 at p. 2). AMCA further recommended that air-circulating fan heads be named as a separate category by DOE. (AMCA, No. 33 at p. 5) BAF suggested that the ratio of diameter (inches) to the maximum speed (RPM) provides a reasonable means for separating air circulating fan heads from LSSD, HSSD and large-diameter ceiling fans. (BAF, No. 36 at pp. 1-2) As a justification of this ratio, AMCA provided analysis of 528 fan models, which included a total of 397 LDCF, HSSD, and LSSD ceiling fan types, as well as 131 ACFHs. Among the sample of ACFH models, the highest diameter-to-maximum operating speed ratio was 0.058, in comparison to the lowest diameter-to-maximum operating speed ratios for the three ceiling fan types (0.353, 0.091, and 0.087 for LDCF, HSSD, and LSSD, respectively). Therefore, even the maximum ratio for the sample of ACFH models is significantly lower than the minimum ratio for the other ceiling fan types, thus showing a clear distinction between ACFH and other ceiling fan types. Based on this analysis, AMCA recommended that ACFHs be designated as a separate category by DOE in its ceiling fan regulations, and that fans meeting the

definition of ACFH per AMCA 230[10] and having a diameter-to-maximum operating speed ratio less than or equal to 0.06 inches/RPM are not "ceiling fans". (AMCA, No. 33 at pp. 4-6)

Similarly, Hunter provided data summarizing the ranges of diameter-to-maximum operating speed ratios for a total of 414 fan models representing LDCF, LSSD, and HSSD ceiling fan categories and ACFHs. The data indicated minimum values of the diameter-to-maximum operating speed ratio for the three ceiling fan types of around 0.10, 0.09, and 0.09 (for LDCF, HSSD, and LSSD, respectively) and a maximum value for ACFHs of around 0.03. Based on this data, Hunter suggested that a ratio of 0.06 would provide a clear separation between ACFHs and all other fan classifications. (Hunter No. 29 at pp. 2-3)

ALA explained, in support of this proposal, that high-velocity fan heads are not used for the purpose of circulating air within the meaning of EPCA's "ceiling fan" definition as these fans do not create air circulation by discharging air in the downward direction for it to be returned to the intake side of the fan with significant momentum. Instead, ALA commented that high-velocity fan heads provide directional, concreated high speed airflow targeted to a specific location. (ALA, No. 34 at pp. 2-3)

AMCA also provided comments on the extent to which the ceiling fan design criteria (in 10 CFR 430.32(s)(1)[11]) would be applicable for ACFHs. Specifically, AMCA

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[10] Section 5.1.1 of AMCA 230-15 defines air circulating fan head as an "assembly consisting of a motor, impeller and guard for mounting on a pedestal having a base and column, wall mount bracket, ceiling mount bracket, I-beam bracket or other commonly accepted mounting means."

[11] The ceiling fan design criteria outlined in 10 CFR 430.32(s)(1) are: (i) fan speed controls separate from any lighting controls: (ii) adjustable speed controls (either more than 1 speed or variable speed); (ii) the capability of reversible fan action, except for (A) fans sold for industrial applications, (B) fans sold for outdoor applications, and (c) cases in which safety standards would be violated by the use of the reversible mode.

stated that (1) the lighting requirements in 10 CFR 430.32(s)(1)(i) would only apply to a very small portion of the ACFH market[12] and that AMCA is unaware of any ACFH with an integrated light kit; (2) the adjustable speed requirement in 10 CFR 430.32(s)(1)(ii) could be applicable, as some ACFHs offer multiple operating speeds, but requiring adjustable speeds would add cost to single-speed products; and (3) the capability of reverse fan action requirement in 10 CFR 430.32(s)(1)(iii) would not be applicable because reverse fan action is typically used for air mixing in the heating season, and the blade shapes of ACFHs do not lend themselves to great utility in the reverse direction. AMCA was also not aware of any ACFHs that were reversible and stated that consumers also do not purchase ACFHs for winter-mode (*i.e*. reverse direction) use. (AMCA, No. 3 pp. 7-8)

DOE performed an independent analysis using available test data from past DOE rulemakings and manufacturer-provided data in support of this test procedure rulemaking to calculate the diameter-to-maximum operating speed to determine whether the currently regulated fans in the test sample had a diameter-to-maximum operating speed ratio of greater than 0.06, as AMCA's provided data suggests. The analysis confirmed that HSSD, standard, and hugger ceiling fans have a diameter-to-maximum operating speed ratio of greater than 0.06 in/RPM, while those fans identified as ACFHs have a diameter-to-maximum operating speed ratio of less than or equal to 0.06 in/RPM.

Table III.1 Summary of DOE Independent CF Definition Analysis

	Number of ceiling fans	**Minimum Diameter-to-Maximum-Operating-Speed Ratio**
Hugger	42	0.098
Standard	49	0.105
HSSD	11	0.078
VSD	8	0.008
		Maximum Diameter-to-Maximum-Operating-Speed Ratio

[12] AMCA explained that dock fans are the only air circulation fans that are typically sold with a light, but the light is typically attached to the mounting arm, not integrated into the fan. (AMCA, No. 33 at p. 7)

ACFH	35	0.029

In regards to VSD ceiling fans, all VSD ceiling fans, for which DOE had available test data, had a diameter-to-maximum operating speed ratio of less than 0.06 in/RPM, indicating that a threshold value of 0.06 in/RPM would not distinguish all VSD ceiling fans from ACFHs. VSDs are discussed further in the discussion that follows.

In this SNOPR, DOE proposes to define the term "circulating air", as it is used in the ceiling fan definition and include a specification that ceiling fans with a maximum operating speed ratio of greater than 0.06 in/RPM is considered to provide circulating air. EPCA does not define "circulating air," but DOE understands that the term can generally be understood as the discharge of air in an upward or downward direction with the air returning to the intake side of the fan, *i.e.*, the air is circulated within a space. In contrast, directional airflow targets the discharged air at a specific location and the discharged air does not return to the intake side of the fan, *i.e.*, directional airflow moves air but does not circulate it within the space. A fan that provides directional airflow, as opposed to "circulating air", would not be a "ceiling fan" as that term is defined in EPCA.

DOE tentatively concludes that the diameter-to-maximum operating speed ratio of 0.06 in/RPM is appropriate to distinguish fans with directional airflow from circulating airflow. Data submitted by commenters as well as DOE's analysis indicate that a ratio of 0.06 in/RPM would distinguish fans that circulate air from fans that provide directional airflow and therefore are not "ceiling fans." With the exception of certain VSD ceiling fans, as described further in the following paragraph, application of this ratio will continue to include within scope LDCF, HSSD, and LSSD ceiling fans, as these fans provide circulating airflow.

As described, certain VSD ceiling fans have a diameter-to-maximum operating speed ratio less than 0.06 and thus would be excluded from the scope of ceiling fans because of the proposed definition for "circulating air". DOE identifies these VSD ceiling fans as "high-speed" VSD ceiling fans because the tip speeds of the VSD ceiling fans discussed in Table III.1 all exceed the LSSD definition tip speed threshold (defined in section 1.16 of Appendix U), regardless of the thickness of the blades. Therefore, these VSD ceiling fans would not meet the LSSD ceiling fan definition. Further, as DOE discussed in the September 2019 NOPR, the current DOE test procedure provides a method of testing only those VSD ceiling fans that meet the LSSD ceiling fan definition. 84 FR 51440, 51445. DOE proposed in the September 2019 NOPR to specify explicitly that VSD ceiling fans that do not also meet the LSSD definition are not required to be tested pursuant to the DOE test method for the purposes of demonstrating compliance with DOE's energy conservation standards for ceiling fans or representations of efficiency. *Id*.

With regard to consideration of "circulating air", DOE understands based on the physical characteristics of the fans that these high-speed VSD ceiling fans provide consumers with directional high-speed airflow and do not circulate air within the space. Specifically, because of the small size (i.e., smaller blade span compared to other small-diameter ceiling fans) and the higher speeds (i.e., tip speeds above the LSSD ceiling fan definition thresholds), the function of these "high-speed" VSD ceiling fans is more akin to air circulating fan heads in that airflow is targeted in a specific direction without the air returning to the intake side of the fan. For this SNOPR, DOE initially determines that these high-speed VSD fans were inappropriately covered and that because they provide directional airflow and are not "circulating air", they would not be considered ceiling

fans. Further, DOE notes that VSD ceiling fans (as a whole) represent less than one percent of the total ceiling fan market.

As discussed, the available data indicates that a diameter-to-maximum operating speed ratio of 0.06 in/RPM would distinguish between fans that provide air circulation and fans that provide directional airflow. The proposed definition for "circulating air", which would incorporate this ratio into the definition, would explicitly exclude from the ceiling fan scope ACFHs and "high-speed" VSDs having a diameter-to-operating speed ratio of less than 0.06 in/RPM. Therefore, including a definition for air circulating fan heads in DOE's test procedure would be unnecessary. DOE is therefore not proposing a definition for air circulating fan head in this SNOPR.

In summary, in this SNOPR, DOE proposes the following definition for "circulating air" for the purpose of the ceiling fan definition:

Ceiling fan means a nonportable device that is suspended from a ceiling for circulating air via the rotation of fan blades. For the purpose of this definition:

(1) *Circulating Air* means the discharge of air in an upward or downward direction with the air returning to the intake side of the fan. A ceiling fan that has a ratio of fan blade span (in inches) to maximum rotation rate (in revolutions per minute) greater than 0.06 provides circulating air.

(2) For all other ceiling fan related definitions, see appendix U to this subpart.

In proposing this amendment, DOE notes that the design standards of EPCA would not be applicable to ceiling fans that do not meet the criteria of the proposed definition. Specifically, EPCA requires all ceiling fans manufactured after January 1, 2007, to have: (i) fan speed controls separate from any lighting controls; (ii) adjustable speed controls (either more than 1 speed or variable speed); and (iii) the capability of reversible fan action, except for fans sold for industrial applications, fans sold for outdoor applications, and cases in which safety standards would be violated by the use of the reversible mode. (42 U.S.C. 6295(ff)(1)(A)) The energy conservation standards established by DOE would also not be applicable to such products.

Alternatively, DOE is considering including the definition of "circulating air" discussed previously within appendix U, instead of within the ceiling fan definition of 10 CFR 430.2.

DOE seeks comment on the proposed definition of "circulating air" for the purpose of the ceiling fan definition. Specifically, DOE requests comment on the use of a "diameter-to-maximum operating speed" ratio to distinguish fans with circulating airflow from directional airflow, and the appropriateness of using 0.06 in/RPM as the threshold ratio. If another ratio should be considered, DOE requests additional data to corroborate that ratio.

DOE seeks comment on the characterization of fans that would fall below the 0.06 in/RPM threshold ratio, such as certain high-speed VSD ceiling fans that do not also meet the definition of an LSSD fan. Specifically, DOE request comment on the appropriateness of excluding high-speed VSD ceiling fans from scope of "ceiling fans."

DOE seeks comment regarding whether "circulating air" should be defined within the definition of ceiling fan at 10 CFR 430.2, as DOE has proposed, or if "circulating air" should be defined separately within appendix U.

B. Scope of Test Procedure for Large-Diameter Ceiling Fans

Currently, section 3.4.1 of appendix U specifies that the test procedure for LDCFs is applicable for ceiling fans up to 24 feet in diameter. While the test procedure is only applicable for ceiling fans up to 24 feet in diameter, there is no language in the energy conservation standards for large diameter ceiling fans (in 10 CFR 430.32(s)(2)(ii)) that explicitly limits the scope of the large-diameter ceiling fan standards to large-diameter ceiling fans with blade spans 24 feet or smaller.[13]

In the September 2019 NOPR, DOE proposed that LDCFs with blade spans greater than 24 feet do not need to be tested pursuant to the DOE test procedure for purposes of determining compliance with DOE energy conservation standards or making other representations of efficiency due to the lack of LDCFs on the market availability of test facilities capable of testing LDCFs, especially those with blade spans greater than 24 feet. 84 FR 51440, 51449 (citing 81 FR 48620, 48632 (July 25, 2016)). In response, BAF provided written comments and statements in the public meeting that BAF does not foresee a need for establishing a limit of 24 feet, which it described as artificial. (Public Meeting Transcript at pp. 98-99; *see also* BAF, No. 36 at p.2) AMCA commented that ceiling fans larger than 24 feet in diameter are uncommon in the United States due to requirements in the United States Standard for the Installation of Sprinkler Systems

[13] While, the Energy Act of 2020 updated 10 CFR 432(s)(2)(ii) to specify that large diameter ceiling fans are subject to the CFEI metric, the previous energy conservation standards or the amended energy conservation standards imposed any upper limit on the blade span for large-diameter ceiling fans.

(NFPA 13). AMCA stated that in some situations ceiling fans larger than 24 feet in diameter could be used (*e.g.*, where sprinklers are not present), and that the AMCA 230-15 test method should be used for those ceiling fans. (AMCA, No. 33 at p. 8)

In this SNOPR, DOE is proposing to remove the 24-foot blade span limit in section 3.4.1 of appendix U. This proposal is based on two primary factors. First, because DOE's test procedure for LDCFs is based on AMCA 230-15, nothing inherent to the test procedure would prevent testing of a ceiling fan greater than 24 feet. AMCA 230-15 provides minimum clearances as a function of blade span, and does not specify an upper limit on blade span. Second, DOE received confirmation that AMCA has a test facility capable of testing ceiling fans with blade spans substantially larger than 24 feet, according to the minimum clearances specified in AMCA 230-15.

DOE seeks comment on its proposal to remove the 24-foot blade span limit in section 3.4.1 of appendix U, which would expand the scope of the test procedure for LDCFs to ceiling fans with blade span larger than 24 feet.

DOE was made aware that AMCA 230-15 was inconsistent in its conversion of measurements to standard air density. Whereas calculated thrust is converted to standard air density (section 9.3 of AMCA 230-15), electric input power is not. Thrust (which is used to determine airflow in cubic feet per minute (CFM)) and electric input power are inputs to the CFEI metric described in AMCA 208-18. Therefore, without the correction, the same fan can have different values for CFEI depending on the density of the air where the fan is being tested. On May 5, 2021, AMCA made a correction to address the inconsistency in the industry standard in the form of a technical errata sheet for AMCA 230-15. The technical errata sheet details that the corrections listed in the errata sheet

apply to all copies of AMCA 230-15. Accordingly, in this SNOPR, DOE clarifies that the technical errata sheet applies to AMCA 230-15, which is currently incorporated by reference in 10 CFR 430.3(b)(4).

C. Belt-Driven Ceiling Fans

Section 1.3 of appendix U defines a belt-driven ceiling fan as "a ceiling fan with a series of one or more fan heads, each driven by a belt connected to one or more motors that are located outside of the fan head." Moreover, in section 2 of appendix U, DOE excludes belt-driven ceiling fans from the scope of the test procedure.

In response to the May 2021 RFI, DOE received a number of comments recommending including certain belt-driven ceiling fans within the scope of the test procedure. Specifically, BAF commented that a new type of belt-driven ceiling fan has come onto the market since the last final rule that uses larger motors and has higher tip speeds (above 5000 feet per minute, or fpm). (BAF, EERE-2021-BT-STD-0011, No. 14 at p. 2). AMCA also commented that a new type of belt-driven fan has come onto the market with a larger motor (1 to 3 hp) and higher tip speeds (5000 to 6000 fpm). (AMCA, EERE-2021-BT-STD-0011, No. 9 at p. 2) BAF recommends that this new variety of belt-driven fans be tested according to AMCA 230-15/AMCA 208. (BAF, EERE-2021-BT-STD-0011, No. 14 at p. 2). AMCA recommended separating belt-driven fans into two classes—high-speed and low-speed—and to test high-speed belt-driven fans according to ANSI/AMCA Standard 230-15, including the technical erratum sheet published by AMCA on May 5, 2021. (AMCA, EERE-2021-BT-STD-0011, No. 9 at p. 4; *see also* BAF, EERE-2021-BT-STD-0011, No. 14 at p. 2)

In the July 2016 Final Rule, DOE discussed that DOE would not propose standards for belt-driven ceiling fans due to the limited number of basic models and lack of available data. 81 FR 48619, 48622. During the last rulemaking, DOE's review of the belt-driven ceiling fan market at the time suggested that these fans are used in bars and restaurants that have decorative ceilings with limited electrical boxes on the ceiling to mount multiple conventional ceiling fans. In addition, DOE noted that the observed belt-driven ceiling fans were highly customizable, in that consumers can decide on the number of fan heads and the kind of fan belts to use. At the time, because these individual fan heads could not be isolated in testing, they could not be testing according to appendix U as written and were thus exempted. (See Chapter 3 of the November 2016 Energy Conservation Standards Final Rule Technical Support Document[14]). While DOE did not establish a test procedure for these fans, DOE noted that it would be investigating appropriate test procedures for belt-driven ceiling fans. 81 FR 48619, 48622.

Since the last rulemaking and based on comments received, DOE has identified higher speed, belt-driven ceiling fans on the market, intended for industrial and commercial applications. DOE conducted market research and found that these fans were typically single-head fans housed in a cage, frequently mounted to the ceiling by straps or brackets as opposed to the traditional downrod. They were marketed for a variety of industrial applications such as agriculture, warehouses, and factories. Like other belt-driven fans, the motors typically exist outside of the housing for the fan, but still located within the cage. However, unlike other belt-driven ceiling fans, they are not customizable, and the fan head can be isolated for testing. DOE notes that, in contrast to the low-speed multiple head belt-driven ceiling fans, these designs allow single-head belt-driven ceiling fans to be tested using current test procedures in appendix U.

[14] Found at: *www.regulations.gov/document/EERE-2012-BT-STD-0045-0149*.

Therefore, DOE proposes to include these higher speed single-head belt-driven ceiling fans within the scope of the test procedure, as long as these fans meet the proposed amended ceiling fan definition.

To distinguish these high-speed belt-driven ceiling fans with one fan head from other low-speed, multiple head belt-driven ceiling fans, DOE proposes the following definition:

High-speed belt-driven (HSBD) ceiling fan means a small-diameter ceiling fan that is a belt-driven ceiling fan with one fan head, and has tip speeds greater than or equal to 5000 feet per minute.

DOE preliminarily concludes that 5000 fpm may be an appropriate threshold based on recommendations from the commenters. However, DOE is considering other thresholds that may be appropriate for the proposed definition.

DOE seeks comment on including within the test procedure scope HSBD ceiling fans, the proposed term and definition, and the appropriate tip speed threshold. Furthermore, DOE requests data on blade thickness and tip speeds for these HSBD ceiling fans.

Further, DOE observed at least one belt-driven ceiling fan that has a marketed blade span greater than 7 feet. DOE proposes to include such ceiling fans in the test procedure scope. To separate these ceiling fans from the proposed HSBD ceiling fan scope, DOE proposes the following definition:

Large-diameter belt-driven (LDBD)ceiling fan means a belt-driven ceiling fan with one fan head that has a represented value of blade span, as determined in 10 CFR 429.32(a)(3)(i), greater than seven feet.

Within this definition, DOE proposes to incorporate the specification for the represented value of blade span as proposed in the September 2019 NOPR. 84 FR 51440, 51450.

DOE seeks comment on including within the test procedure scope LDBD ceiling fans, and the proposed definition.

Alternatively, DOE may consider a combined term and definition for all belt-driven ceiling fans that meet the above scope of HSBD and LDBD ceiling fans. Specifically, DOE could remove the "small-diameter" part of the aforementioned HSBD definition. By removing "small-diameter" in the definition, the alternate HSBD definition should accommodate belt-driven ceiling fans with blade spans greater than seven feet. DOE alternatively proposes that the term high-speed belt-driven ceiling fan reads as follows:

High-speed belt-driven ceiling fan (HSBD) means a ceiling fan that is a belt-driven ceiling fan with one fan head, and has tip speeds greater than or equal to 5000 feet per minute.

DOE seeks comment on the alternate definition for HSBD ceiling fans, and whether it would incorporate all the LDBD ceiling fans from DOE's primary proposal. Further, DOE requests comment on whether the HSBD and LDBD ceiling fan scope should be combined, *i.e.*, what is the utility and application of the two fan categories.

In conversations with manufacturers, DOE learned that the HSBD ceiling fans and LDBD ceiling fans move significantly more air than HSSD ceiling fans and as such, these fans could be difficult to test under the small-diameter ceiling fan test procedure (i.e., using sensor arm setup) due to the possibility of inducing vortexes in the smaller testing room.[15] Typically, HSSD fans use a fractional horsepower (*i.e.,* less than 1 horsepower) direct-drive motor. By contrast, these HSBD ceiling fans and LDBD ceiling fans use a much larger motor, often in excess of 1 horsepower ("HP"), to spin with much higher tip speeds.

DOE received comments from two stakeholders on testing these fans to AMCA 230-15. Both BAF and AMCA also recommended testing all high-speed belt-driven fans according to appendix U corrected, i.e., ANSI/AMCA Standard 230-15. (AMCA, EERE-2021-BT-STD-0011, No. 9 at p. 4; *see also* BAF, EERE-2021-BT-STD-0011, No. 14 at p. 2) Therefore, DOE proposes to test both HSBD ceiling fans and LDBD ceiling fans according to AMCA 230-15. DOE proposes to specify that HSBD ceiling fans and LDBD ceiling fans be tested using the test apparatus in appendix U, section 3.4, which references AMCA 230-15.[16]

DOE requests comment on requiring AMCA 230-15 as the test procedure for HSBD and LDBD ceiling fans, or whether DOE should consider any other test procedure.

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[15] Vortexes in the testing room creates highly turbulent air flow that revolves around an axis and can move at differing speeds depending on the air distance from the vortex center of rotation. These swirling and turbulent air flows would make it difficult for the air velocity sensors used in the small-diameter ceiling fan test procedure to meet the stability criteria.

[16] AMCA 208-18 includes the calculation method for the fan energy index (FEI). AMCA-208 references several other test methods for calculation of fan air performance, depending on the fan type, including AMCA 230-15. Both AMCA 208-18 and AMCA 230-15 are referenced in appendix U.

While some of the HSBD ceiling fans and LDBD ceiling fans are advertised as being capable of variable speed operation, and sold with a variable speed drive, others are advertised as only capable of single speed operation. For HSBD and LDBD ceiling fans capable of only single speed operation, DOE proposes that both HSBD and LDBD ceiling fans be tested only at high speed operation. For HSBD and LDBD ceiling fans capable of variable speed operation, DOE proposes that HSBD and LDBD ceiling fans also be tested at high speed operation and 40 percent speed.

DOE requests comment on its proposal to test single speed HSBD and LDBD ceiling fans only at high speed and variable speed HSBD and LDBD ceiling fans at high speed and 40 percent speed. Alternatively, DOE requests comment on the typical number of operating speeds and hours for HSBD ceiling fans and LDBD ceiling fans.

As stated previously, the quantity of air moved by HSBD ceiling fans and LDBD ceiling fans is significantly greater than HSSD ceiling fans on the market and more similar to the max airflow (or CFM) of large-diameter ceiling fans. Therefore, DOE proposes that the efficiency metric for both HSBD ceiling fans and LDBD ceiling fans be CFEI, consistent with large-diameter ceiling fans. Therefore, DOE is proposing to modify the language in appendix U, section 3.5 to specify that for HSBD ceiling fans and/or LDBD ceiling fans capable of only single speed operation, the CFEI should be calculated only at high speed. Similarly, DOE is proposing that for large-diameter, HDBD, and LDBD ceiling fans the CFEI be calculated at high speed and 40 percent speed.

Alternatively, DOE is also considering the small-diameter ceiling fan metric, CFM/W, for HSBD ceiling fans and/or LDBD ceiling-fans. If DOE were to consider a CFM/W metric, DOE would need to account for the number of operating hours in active

mode and the number of hours at each operating speed. DOE would also need data on the number of hours in standby mode.

DOE requests comment on whether the efficiency of HDBD ceiling fans and LDBD ceiling fans is more appropriately evaluated using the CFEI or CFM/W metric.

D. Standby Power Metric for Large-Diameter Ceiling Fans

As discussed previously, the Energy Act of 2020 specifies that LDCFs are no longer required to meet minimum ceiling fan efficiency requirements in terms of the ratio of total airflow to total power consumption, CFM/W, as established in the January 2017 Final Rule. (See also 42 U.S.C. 6295(ff)(6)(C)(i)(I)) Instead, Congress established separate minimum efficiency standards for two distinct modes of LDCF operation. (42 U.S.C. 6295(ff)(6)(C)(i)(II)) Specifically, Congress defined standards based on a CFEI at high speed, and at 40 percent speed or the nearest speed that is not less than 40 percent speed. *Id.* The Energy Act of 2020 amendments to EPCA explain that "CFEI" means the Fan Energy Index for large-diameter ceiling fans, and that it is calculated in accordance with ANSI/AMCA Standard 208–18 titled "Calculation of the Fan Energy Index", with the following modifications: Using an Airflow Constant (Q_0) of 26,500 cubic feet per minute; using a Pressure Constant (P_0) of 0.0027 inches water gauge; and using a Fan Efficiency Constant (η_0) of 42 percent. (42 U.S.C. 6295(ff)(6)(C)(ii)) Whereas the CFM/W metric incorporated active mode and standby mode into a single metric, the new CFEI metric, adopted in the Energy Act of 2020, incorporates only active mode, without accounting for standby mode.

EPCA requires amended test procedures and energy conservation standards to incorporate standby mode and off mode energy use.[17] (42 U.S.C. 6295(gg)(2) and (3)) Amended test procedures must integrate standby mode and off mode energy consumption into the overall energy efficiency, energy consumption, or other energy descriptor, unless the current test procedures for a covered product already incorporate standby mode and off mode energy consumption, or such an integrated test procedure is technically infeasible, in which case the Secretary shall prescribe a separate standby mode and off mode energy use test procedure for the covered product, if technically feasible. (42 U.S.C. 6295(gg)(2)(A))

DOE has initially determined that it would be technically infeasible to integrate standby power with each of the statutory CFEI requirements (*i.e.*, high-speed requirement and 40-percent requirement), such that the integrated metric would be representative of an average period of use as required by EPCA. (*See* 42 U.S.C. 6293(b)(3)) The two standards for LDCFs established by Congress require measurement of energy efficiency at two separate modes of operation, both of which occur during active mode (*i.e.,* operation of the fan at high speed, and operation of the fan at 40 percent speed or the nearest speed that is not less than 40 percent speed). Each energy efficiency measurement, by itself, does not fully represent active mode energy efficiency (and even a combination of the two may not fully represent active mode).

[17] EPCA defines "standby mode" as the condition in which an energy-using product: is connected to a main power source, and offers one or more of the following user-oriented or protective functions: (1) The ability to facilitate the activation or deactivation of other functions (including active mode) by remote switch (including remote control), internal sensor, or timer; and (2) continuous functions, including information or status displays (including clocks), or sensor-based functions. (42 U.S.C. 6295(gg)(1)(A)(iii)) "Off mode" is the condition in which the ceiling fan is connected to a main power source and is not providing any standby or active mode function. (42 U.S.C. 6295(gg)(1)(A)(ii))

Standby mode is a distinct mode from either of the segments of active mode for which energy efficiency is measured. If an LDCF is consuming energy, but not operating in active mode, it is operating in either standby mode or off mode.[18]

Given that, as previously discussed, each metric required by the Energy Act of 2020 does not fully account for active mode energy use/efficiency, neither metric would be appropriately representative if integrated with standby mode operation because the resulting metric would capture a portion of active mode energy and the total standby energy use. Such an integrated metric would not be representative of an average period of use. Further, were standby power integrated into the measurements required for both LDCF standards, the same standby energy use would be represented twice - once with the integrated high-speed metric and once with the integrated 40-percent metric. The standby mode energy use could be scaled to the active mode energy use for the corresponding LDCF standard, but under such a metric, standby mode energy use would not be fully captured. Even if both LDCF standards were integrated with a scaled standby energy use, the total standby mode energy use may not be captured because the measurements for the two LCDF standards may not represent the complete active mode operation.

For the reasons discussed in the preceding paragraphs, DOE is proposing a separate metric for standby mode energy use.

Specifically, DOE proposes for the test method for power consumption in standby mode already established in section 3.6 of appendix U to remain applicable to LCDFs.

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[18] Consistent with the discussion in the October 2014 test procedure NOPR for ceiling fans, DOE's research continues to suggest that there is no off mode power consumption for ceiling fans, so DOE is not proposing an off-mode power efficiency metric or off mode testing. *See* 79 FR 62522, 62524 (Oct. 17, 2014).

The standby mode test method measures standby power in watts and is based on IEC standard 62301:2011, with modifications to reduce test burden by reducing the interval of time over which testing occurs as well as the period of time required prior to standby testing.

DOE notes that no standby standard is currently applicable to LDCFs and that were DOE to adopt the proposed standby test procedure and metric for LDCFs, manufacturers would not be required to test to that provision until such time as compliance is required with an energy conservation standard for standby mode, should such a standard be established.

DOE seeks comment on its preliminary determination that establishing an integrated metric that incorporates the energy efficiency measured as required under each LCDF standard and the energy use measured during standby mode would be technically infeasible.

DOE seeks comment on its proposal to specify for LDCFs a separate standby mode energy use metric, which would be based on the standby power procedure defined in section 3.6 of appendix U.

DOE also notes that if a CFEI standard is established for HSBD ceiling fans and LDBD ceiling fans, as is being proposed in this SNOPR, a separate standby mode energy use metric would need to be established. Similar to the LDCFs, DOE proposes for the test method for power consumption in standby mode already established in section 3.6 of appendix U to be applicable to HSBD ceiling fans and/or LDBD ceiling fans. The standby mode test method measures standby power in watts and is based on IEC standard

62301:2011, with modifications to reduce test burden by reducing the interval of time over which testing occurs as well as the period of time required prior to standby testing.

Alternatively, were DOE to decide that a CFM/W metric is more appropriate for HSBD and LDBD ceiling fans, DOE proposes that the standby power would be incorporated into the CFM/W metric, similar to other small-diameter ceiling fans, and would be calculated according to section 3.6 of appendix U.

DOE seeks comment on its proposal to specify for HSBD ceiling fans and LDBD ceiling fans a separate standby mode energy use metric, which would be based on the standby power procedure defined in section 3.6 of appendix U.

E. Low-Speed Definition

Section 1.12 of appendix U defines low speed to mean "the lowest available ceiling fan speed, *i.e.*, the fan speed corresponding to the minimum, non-zero, blade RPM."

In the September 2019 NOPR, DOE described that through round robin testing and industry inquiry, DOE is aware that the lowest available fan speed on some ceiling fans provides an extremely low rotation rate, leading to atypically low airflow. 84 FR 51440, 51446. Because of the extremely low rotation rate and atypically low airflow consumers are unlikely to use such a setting to circulate air. It is expected that such a low fan speed is provided for aesthetic purposes; for example, one such product advertises the lowest speed as helping to maintain a "calm atmosphere."[19] For such products, the lowest

[19] See example product brochure at *https://www.lowes.com/pd/Hunter-52-in-Indoor-Multi-position-Ceiling-Fan-with-Light-Kit-5-Blade/1270423* which discusses the fan's "serenity speed".

speed available on the ceiling fan is not representative of the lowest speed for that product that can provide "circulation of air".

In addition to not being representative of a speed that can circulate air, DOE has observed through round robin testing that requiring testing at the "lowest available speed" on such products creates added test burden because laboratories have difficulty meeting the stability criteria[20] despite routinely achieving stability for other fans (without such extremely low speed settings). 84 FR 51440, 51446-51447. Accordingly, in the September 2019 NOPR, DOE stated that it is considering modifying the definition of low speed. Specifically, DOE suggested defining the low speed for the purpose of testing as the lowest available ceiling fan speed for which fewer than half or three, whichever is fewer, sensors on any individual axis are measuring less than 30 feet per minute ("FPM"). In conjunction, DOE considered providing explicit instructions in the test procedure to start at the lowest speed and move to the next highest speed until the modified low speed criteria are met. DOE requested comment on this modification. 84 FR 51440, 51447

In response to the September 2019 NOPR, ALA, AMCA, BAF, Hunter and Ransom supported DOE's proposal to redefine low speed. (ALA, No. 34 at p. 3; AMCA, No. 33 at p. 8; BAF No. 36 at p. 2; Hunter No. 29 at p. 4; Ransom, No. 35 at p. 1) During the public meeting, AMCA discussed how low speed in a residential setting sometimes serves as a different function for the consumer than the movement and recirculation of air (i.e., "serenity mode") and measuring this speed under the current test procedure is erratic and can end up being a non-qualifying test. (AMCA, Public Meeting Transcript at p. 52-

[20] Section 3.3.2(1) of Appendix U defines the stability criteria for airflow. Airflow is considered stable if the average air velocity for all axes for each sensor varies by less than 5% compared to the average air velocity measured for that same sensor in a successive set of air velocity measurements.

53) Westinghouse also was generally supportive of the proposal. (Westinghouse, Public Meeting Transcript at p. 57) Ransom suggested that adding an exception for fans with "serenity modes"[21] would benefit manufacturers in applications where this aesthetic is desired. (Ransom, No. 35 at p. 1) ALA and Hunter commented that the "serenity" features satisfy a consumer aesthetic desire or provide decorative utility. (ALA, No. 34 at p. 4; Hunter No. 29 at p. 4) In response to DOE's suggested definition in the September 2019 NOPR, ALA commented that "low speed" should be defined as "the lowest available ceiling fan speed for which fewer than half or three, whichever is fewer, sensors on any individual axis are measuring less than 40 FPM, rather than 30 FPM." (ALA, No. 34 at p. 3) BAF also suggested 40 FPM as the lowest speed at which draft begins to be felt at the occupant level. (BAF, Public Meeting Transcript at p. 61)

The current definition of low speed could require testing LSSD ceiling fans and VSD ceiling fans that also meet the definition of an LSSD fan at a speed with an extremely low rotation rate, which consumers are unlikely to use to circulate air. Rather, as suggested by Hunter and ALA, this speed is used more for a consumer aesthetic desire, as indicated by this speed being advertised as helping to maintain a "calm atmosphere." For such products, the low speed as defined for the purpose of the current DOE test procedure is not representative of the low speed required for "circulation of air".[22] Further, as observed through round robin testing and as discussed previously, requiring

[21] DOE interprets "serenity mode" as the speed with an extremely low rotation rate, leading to a typically low airflow.

[22] DOE has proposed to define circulating air as "the discharge of air in an upward or downward direction with the air returning to the intake side of the fan. A ceiling fan that has a ratio of fan blade span (in inches) to maximum rotation rate (in revolutions per minute) greater than 0.06 provides circulating air." The extremely low rotation rates described in this section provide insufficient air movement for the discharge of air to return to the intake side of the fan.

testing at the "lowest available speed" would be overly burdensome to test because laboratories have trouble meeting the stability criteria.

For the September 2019 NOPR, DOE initially developed the 30 FPM threshold by identifying the threshold below which several common varieties of air velocity sensors could no longer meet the test procedure accuracy and stability requirements. 84 FR 51440, 51447. However, DOE had also stated in the September 2019 NOPR that ceiling fans with low speeds that produce air velocities lower than 40 FPM may have trouble meeting the stability criteria. 84 FR 51440, 51446. As noted, section 3.2 of appendix U specifies that air velocity sensors must have an accuracy within ±5% of reading or 2 FPM, whichever is greater. In further reviewing these accuracy requirements, DOE notes that the 2 FPM accuracy tolerance can be determined by multiplying the 5 percent accuracy requirement with 40 FPM, indicating that an air velocity threshold of 40 FPM, rather than 30 FPM, would better align with these established stability criteria. Furthermore, for the September 2019 NOPR proposal of a 30 FPM threshold, DOE had not evaluated every sensor used by laboratories and considered the commenters' proposals to use a 40 FPM threshold to be more representative based on industry experience.

For the reasons discussed, DOE proposes to amend the low-speed definition as follows:

Low speed means the lowest available ceiling fan speed for which fewer than half or three, whichever is fewer, sensors per individual axis are measuring less than 40 feet per minute.

Alternatively, DOE is considering representing the proposed definition as a table indicating the number of sensors that must measure > 40 FPM, as follows:

Low speed means the lowest available speed that meets the following criteria:

Number of sensors per individual axis as determined in section 3.2.2(6) of Appendix U	Number of sensors per individual axis measuring 40 feet per minute or greater
3	2
4	3
5	3
6	4
7	4
8	5
9	6
10	7
11	8
12	9

Furthermore, DOE proposes to include explicit instructions in the test procedure to start at the lowest speed and move to the next highest speed until the modified low speed criteria are met. This would ensure the identification of the lowest speed of the fan that meets the proposed low speed definition. DOE understands that most LSSD ceiling fans have distinct speed settings and would be able to accommodate this proposal.

DOE expects that this proposed amendment would reduce the total test time per unit for low speed tests for a subset of LSSD ceiling fans. Under the current test procedure, the low speeds in question would likely require laboratories to run tests for a long period (potentially the full duration of the laboratories' local operating procedures limit) before achieving the necessary stability criteria requirements. The proposed alternate test method could mitigate the occurrence of these long test runs. DOE estimates that manufacturers of LSSD ceiling fans that conduct testing in-house could save approximately 60 minutes in per unit testing time due to the new low speed criteria.

DOE does not expect this amendment to require retesting or to change measured efficiency for the majority of LSSD ceiling fans. However, for the small subset of LSSD ceiling fans for which the lowest speed is at an extremely low rotation rate and provides a low airflow, retesting may be required if the lowest speed does not meet the proposed definition of low speed. In the instances under the proposal for which testing at the next highest speed were to be required, testing at the next highest speed would likely result in increased power consumption, but it would also result in increased airflow. The resulting ceiling fan efficiency is calculated by weighting the airflow and power consumption results from the high speed test (which is not proposed to be amended) with the low speed test, resulting in a weighted average CFM/W (Equation 1, Appendix U). Because the measured efficiency is a ratio of airflow and power consumption and testing at the next highest speed would result in an increase in airflow as well as power consumption, DOE expects the low speed proposal to have insignificant effect on ceiling fan efficiency for the applicable subset of LSSD ceiling fans.

The potential cost and cost saving impacts of this proposal are discussed in section III.K.1.a. of this document.

DOE seeks comment on the proposal to update the low speed definition as follows: *Low speed* means the lowest available ceiling fan speed for which fewer than half or three, whichever is fewer, sensors per individual axis are measuring less than 40 feet per minute.

DOE also seeks comment on the alternate proposal to represent low speed as a table specifying the number of sensors per individual axis required to measure greater than 40 feet per minute.

DOE seeks comment on the proposal to require testing to start at the lowest speed and move to the next highest speed until the modified low speed criteria are met. Specifically, DOE seeks comment on whether any applicable variable speed LSSD ceiling fans (without distinct speed settings) would require further specificity on this proposal and if so, how it should be specified.

Hunter, ALA, BAF and AMCA further commented that if either tested fan sample (per DOE sampling requirements) has a lowest-speed setting that does not meet the definition of low speed under this proposal, both samples should be tested at the next highest speed. (Hunter, No. 29 at p. 4; ALA, No. 34 at p. 3; BAF, No. 36 at p. 2; AMCA, No. 33 at p. 8) DOE requires that ceiling fan representation must be based on sampling requirements prescribed at 10 CFR 429.11, which specifies that the minimum number of units tested shall be no less than two. 10 CFR 429.32. Testing of ceiling fans must be conducted according to Appendix U, which as proposed, would require determining the setting that meets the definition of low speed individually for each of the units in the sample, if applicable. As discussed previously, 40 FPM is representative of the low speed required for “circulation of air”. To the extent that there is any variation within the sample of fans for a basic model, determining the setting that meets the definition of low speed individually for each unit in the sample would correspond to how each unit in the sample would be operating during a representative average use cycle.

DOE requests comment on the extent to which, for DOE certification purposes, an individual unit within a sample of fans (per basic model) could have a different setting that meets the proposed definition of low speed than other units within the same sample.

If so, DOE requests data on how the issue could affect representativeness (in terms of ceiling fan efficiency) of the basic model.

F. Sensor Arm Setups

To record air velocity readings, Section 3.3.2 of appendix U prescribes two setups for taking airflow measurements along four perpendicular axes (designated A, B, C, and D): a single rotating sensor arm or four fixed sensor arms. If using a single rotating sensor arm, airflow readings are first measured on Axis A, followed by successive measurements on Axes B, C, and D. If using four fixed sensor arms, the readings for all four axes are measured simultaneously. See Steps 4 and 5 of section 3.3.2(2) of appendix U. The team has observed that valid results are generally attained more quickly using the four-arm setup because measurements are taken simultaneously in all four axes and stability can be achieved in fewer runs (*i.e.*, a complete set of air velocity measurements for all axes). However, a four-arm setup is more expensive because it requires at least 4 times as many sensors. This setup is typically used by laboratories that primarily test LSSD fans (which require low airflow to be measured) or laboratories that test large quantities of fans, for which a faster throughput is important. A single-arm setup is less expensive and is typically used by laboratories that test mostly high-speed ceiling fans or test very few ceiling fans.

The single-arm setup requires the rotation of the arm every 100 seconds, which disrupts the air, often increasing the time to achieve stability. Assuming it takes 3 cycles to reach stability for the low-speed test (*i.e.*, average air velocity across all sensors for cycles 2 and 3 meet the stability criteria), the test length would be around 16 minutes for the four fixed arm unit and around 41 minutes for the single rotating

arm unit.[23] During round robin testing, DOE personnel noted that laboratories using the single rotating sensor arm waited approximately 30 seconds for arm vibration to dissipate before starting data collection at the new position, adding a minimum of 1 minute 30 seconds to each test cycle.

During round-robin testing, laboratories with single-arm setups were able to achieve stability for 75 percent of fans tested, as compared to 96 percent for laboratories using four-arm setups.

To address stability issues in a single-arm setup, DOE proposes, based on observations from the round robin testing, to provide explicit instruction for setups that require arm rotation to stabilize the arm and allow 30 seconds between test runs for any residual turbulence to dissipate prior to data collection after each rotation. While this additional instruction would increase testing time of each axis, based on observation through round robin testing, DOE has initially determined that this requirement could further contribute to more accurate and stable airflow measurements during testing. In some cases, this could reduce overall testing time by avoiding the need to retest to meet the required air velocity stability criteria (section 3.3.2(1) of appendix U).

As an alternative to the single- and four-arm setup options, DOE also proposes to allow laboratories to rely on test setups with two arms, so that the system would need to be rotated only once to collect data for all four axes. A two-arm setup would require less time to collect the necessary data than a 1-arm setup and would therefore reduce testing burden for laboratories currently using a 1-arm setup. It would also require fewer sensors

[23] These time frames were determined in the round robin report, found in the rulemaking docket EERE-2013-BT-TP-0050. *www.regulations.gov/docket/EERE-2013-BT-TP-0050*

than a four-arm setup, and could therefore provide a cost-effective approach to achieve stability conditions more easily at low speed. DOE proposes to amend sections 3.2.2(4) and 3.3.2 of appendix U to accommodate the use of a two-arm setup.

DOE seeks comment on the proposed requirement to add 30 seconds between test runs for a rotating arm setup (either single-arm or two-arm).

DOE seeks comment on its proposal to permit the use of a two-arm setup, as well as any data to confirm that a 2-arm option produces comparable results to the existing 1-arm and 4-arm options.

G. Air Velocity Sensor Mounting Angle

Section 3.2.2 of appendix U does not specify the applicable mounting angle of the sensors on the sensor arm.

Air velocity is most accurately measured by aligning the velocity sensor perpendicular to the airflow path, as this is the orientation for which the airflow through the openings of the sensor is smooth and free of turbulence. However, during recent round robin testing, the team noted that some air velocity sensors were not aligned perpendicular to the path of airflow. A misaligned velocity sensor could produce inaccurate air velocity measurements. Therefore, to ensure consistent air velocity alignment, DOE proposes to include explicit instructions in section 3.2.2(6) of appendix U to align the air velocity sensors perpendicular to the direction of airflow. DOE could also consider updating Figure 2 of appendix U (which would be renumbered as Figure 3

in this proposal), or adding a new figure, to depict more clearly the alignment of the velocity sensors perpendicular to the direction of airflow.

DOE requests comment on its proposal to specify aligning the air velocity sensors perpendicular to the airflow. DOE also requests comment on whether it should revise Figure 2 of appendix U, and/or provide an additional figure, to depict more clearly the alignment of the velocity sensors perpendicular to the direction of airflow.

H. Instructions to Measure Blade Thickness

Sections 1.8 and 1.13 in appendix U incorporate a fan blade thickness threshold of 3.2 mm within the definitions of HSSD ceiling fan and LSSD ceiling fan, respectively. Blade edge thickness is used to distinguish product classes because it relates to safety considerations that, in turn, relate to where a ceiling fan is likely to be installed. Commercial and industrial ceiling fans are typically installed in locations with higher ceilings, and therefore thin leading edges on the blades do not present the safety hazard that thin leading edges would present on ceiling fans that are installed at lower heights, *i.e.*, residential ceiling fans.

Appendix U currently does not provide instruction for how to measure fan blade thickness. In the September 2019 NOPR, DOE proposed that blade edge thickness for small diameter fans be measured at the leading edge of the fan blade (*i.e.*, the edge in the forward direction) with an instrument having a measurement resolution of at least a tenth of an inch. DOE also proposed the following instructions for measuring blade edge thickness to ensure test procedure reproducibility, given potential variations in blade characteristics: (1) Measure at the point at which the blade is thinnest along the radial length of the fan blade and is greater than or equal to one inch from the tip of the fan

blade, and (2) Measure one inch from the leading edge of the fan blade. 84 FR 51440, 51450.

DOE has subsequently become aware of a "rolled-edge" blade design on a residential ceiling fan for which the thickness of the body of the blade is less than 3.2 mm, but that has a curled shape along the leading edge, with the curl having an outer thickness greater than 3.2 mm. For such a rolled-edge blade, the blade thickness measurement procedure proposed in the September 2019 NOPR would indicate a "thin blade" despite the thicker leading edge, resulting in the fan being classified as an HSSD, which as discussed are generally non-residential fans. Conversely, measuring the thickness at the rolled edge (less than one inch from the leading edge) would result in the fan being classified as an LSSD, which are generally residential fans. In order to measure blade thickness for "rolled-edge," flat, tapered, and other ceiling fan blade types in a manner that will consistently classify ceiling fans with these blade types into the right product class, DOE is proposing to update the proposal for measuring blade thickness as follows: (1) locate the cross section perpendicular to the fan blade's radial length, that is at least one inch from the tip of the fan blade and for which the blade is thinnest, and (2) measure the thickest point of that cross section within one inch from the leading edge of the fan blade.

DOE expects that this proposal would result in ceiling fans with "rolled-edge" blade designs being assigned to the appropriate product class, while having minimal effect on the blade thickness measurement of other blade types relative to the proposal in the September 2019 NOPR.

DOE seeks comment on its proposal to measure ceiling fan blade thickness at the thickest point within 1" of the blade's leading edge, along the plane perpendicular to the blade's radial length at which the blade is thinnest. Specifically, DOE seeks feedback on if this update will prevent ceiling fans from being incorrectly classified into the wrong product class. DOE also welcomes feedback on if the blade thickness should be measured within 1" of the leading edge, or if the allowable thickness measurement zone should be restricted to closer to the leading edge (e.g., within ½" or ¼" of the leading edge).

I. Specifications for Ceiling Fans with Accessories

Sections 3.3.1 ("Test conditions to be followed when testing") and 3.5.1 of appendix U, require that a ceiling fan's heater and light kit be installed, but not energized during the power consumption measurement. These provisions are in place to include any impact these accessories might have on airflow, but prevent any reduction of the measured airflow efficiency that would result from including power consumption that does not relate to the ceiling fan's ability to circulate air. Beyond heaters and light kits, an increasing number of ceiling fan models on the market contain other features, such as air ionization and ultraviolet technology, that do not relate to the ceiling fan's ability to circulate air, but that consume power and therefore could reduce the measured airflow efficiency.

DOE proposes to amend the language in sections 3.3.1 and 3.5.1 in appendix U to apply more broadly to any additional accessories or features that do not relate to the ceiling fan's ability to create airflow by rotation of the fan blades. Specifically, DOE proposes that such accessories or features must not be energized during testing. If the

accessory or feature cannot be turned off, it shall be set to the lowest energy-consuming mode during testing. This proposal would clarify the application of the test procedure to ceiling fans with accessories or features other than light kits and heaters, while not incurring additional test costs or burdens. DOE does not expect this clarification to result in manufacturers having to re-test their ceiling fans, because DOE expects that manufacturers would have set such accessory features to their lowest energy-consuming state during testing.

DOE seeks comment on its proposal to require that testing be performed without any additional accessories or features energized, if possible; and if not, with the additional accessories or features set at the lowest energy-consuming mode for testing.

J. Product Specific Rounding and Enforcement Provisions

1. Airflow (CFM) at High Speed Rounding

In the September 2019 NOPR, DOE proposed amendments to 10 CFR 429.32 to specify that represented values are to be determined consistent with the test procedures in appendix U and to specify rounding requirements for represented values. 84 FR 51440, 51450. DOE proposed represented value and rounding requirements for product-specific information that was necessary to determine the minimum allowable ceiling fan efficiency and the proper category of certain ceiling fans, including blade span, blade RPM, blade edge thickness and distance between the ceiling and the lowest point on the fan blades. *Id* In this SNOPR, DOE is proposing alternate rounding requirements for blade edge thickness, as discussed in section III.J.2.

DOE notes that airflow (CFM) at high speed is also product-specific information required to determine product category. Specifically, airflow (CFM) at high speed is required to determine whether a ceiling fan is a highly-decorative ceiling fan. While 10 CFR 429.32(a)(2)(i) already provides the represented value calculation for airflow, neither that section nor appendix U provides any rounding requirements for airflow at high speed as it relates to determining whether a ceiling fan is a highly-decorative ceiling fan. Accordingly, in this SNOPR, DOE proposes to specify that any represented value of airflow (CFM) at high speed, including the value used to determine whether a ceiling fan is a highly-decorative ceiling fan, is determined pursuant to 10 CFR 429.32(a)(2)(i) and rounded to the nearest CFM. Manufacturers are already required to determine this value if making representations under the current test procedure for ceiling fans and will be required to use this value to ensure the products they distribute in commerce comply with the amended energy conservation standards. Further, the rounding of airflow to the nearest CFM is consistent with the current DOE guidance for the Federal Trade Commission ("FTC") EnergyGuide label.

DOE seeks comment on its proposal to specify that any represented value of airflow (CFM) at high speed, including the value used to determine whether a ceiling fan is a highly-decorative ceiling fan, is determined pursuant to 10 CFR 429.32(a)(2)(i) and rounded to the nearest CFM.

2. Blade Edge Thickness Rounding and Tolerance

Appendix U of 10 CFR part 430 currently does not prescribe measurement tolerances for blade edge thickness. The September 2019 NOPR proposed that blade edge thickness for small-diameter ceiling fans be measured with an instrument with a

measurement resolution of at least one tenth of an inch. Further, DOE proposed that blade edge thickness be rounded to the nearest tenth of an inch, effectively providing a tolerance range of ±0.1 in. See 84 FR 51440, 51450-1. This tolerance would enable both tape measures and calipers to be used for this measurement, which typically have resolutions of 1/32 in (0.03 in) and 0.001 in, respectively. In response to the September 2019 NOPR, ALA and Hunter suggested that blade edge thickness should be measured with dial calipers only. (Hunter No. 29 at p.5; ALA, No. 34 at p. 4) Hunter stated that the proposed blade thickness resolution of 0.1 inches is too large and that a tape measure cannot be used, and instead recommended that the required instrument resolution should be 0.001 in, with a measurement tolerance of ±1/32 in. (Hunter No. 29 at p. 5)

Upon further consideration, DOE recognizes that a rounding and tolerance requirement of ±0.1 in would not provide sufficient resolution (*i.e.* number of digits) to represent fan blade edge thickness in relation to the 3.2 mm (0.126 in) threshold defined in Sections 1.8 and 1.13 in appendix U. Based on observation from round robin testing, DOE understands that most, if not all, laboratories use calipers to measure blade edge thickness. Accordingly, in this SNOPR, DOE proposes to require the use of an instrument with a measurement resolution of at least 0.001 in, and for the blade edge thickness measurement to be rounded to the nearest 0.01 in. This effectively would provide a tolerance range of approximately 0.01 in.

DOE requests comment on the proposed instrument measurement resolution, rounding and tolerance requirements for blade edge thickness measurements.

3. Blade RPM Tolerance

For LDCFs, section 3.5(2) of appendix U specifies that when testing at 40 percent speed for ceiling fans that can operate over an infinite number of speeds, ensure the average measured RPM is within the greater of 1% of the average RPM at high speed or 1 RPM. Appendix U does not prescribe a tolerance for measuring RPM of the high speed itself. In the September 2019 NOPR, DOE proposed to extend these tolerances to high speed for all ceiling fans, and to consider the represented blade RPM at high speed to be valid if the measurement(s) (either the measured value for a single unit, or the mean of the measured values for a multiple unit sample, rounded to the nearest RPM) are within the greater of 1% or 1 RPM of the represented blade RPM at high speed. 84 FR 51440, 51451.

In response, ALA asked DOE to clarify whether the 1 percent verification measurement would apply only to LDCFs. (ALA, No. 34, at p. 4) Hunter commented that the tolerance of 1 percent is too tight because too many variables, such as variation in voltage and measuring equipment, exist between laboratories for manufacturers to be able to meet this tight tolerance. Hunter suggested that instead, the tolerance should be increased from ±1% to ±3%. (Hunter No. 29 at p. 4)

In this SNOPR, DOE further considered the appropriate tolerances for voltage and measuring equipment variations, recognizing that such variation directly impacts the blade RPM measurements. For voltage, section 3.3.1(5)(iii) of appendix U allows the test voltage to vary by ±1% throughout the test. For measuring equipment variation, Appendix U does not specify a required accuracy for tachometers used in testing. However, the tachometer used by several of the participating round-robin laboratories has an accuracy of ±0.01% of the reading.[24] Combining the voltage variation tolerance and

[24] The data sheet for the referenced tachometer can be found here: *https://monarchserver.com/Files/pdf/ACT3x_Datasheet_May_19.pdf*

equipment accuracy variation with the September 2019 NOPR proposal of 1% tolerance of represented blade RPM at high speed would result in an overall tolerance of ±2.01%. Therefore, DOE proposes to increase the tolerance for blade RPM measurements at high speed from ±1% to ±2% to account for voltage variation and equipment resolution.

DOE seeks comment on its proposal to define a tolerance of 2% for blade RPM measurements at high speed. If other tolerances are recommended, DOE seeks specific equipment and/or voltage variation data to justify the recommended tolerance.

4. Represented Values within Product Class Definitions

In the September 2019 NOPR, DOE proposed updates to the product class definitions in appendix U to reference the proposed represented value provisions to specify that the product class for each basic model is determined using the represented values of blade span, blade RPM, blade edge thickness, and the distance between the ceiling and the lowest point on the fan blades. 84 FR 51440, 51450. In reviewing the September 2019 NOPR proposed updates to the definitions, DOE noted that the definitions referenced the incorrect regulatory text sections for the represented values proposed in 10 CFR 429.32. As such, in this SNOPR, DOE proposes updates to the references within the product class definitions to reference the appropriate represented value regulatory text sections.

K. Test Procedure Costs, Harmonization, and Other Topics

1. Test Procedure Costs and Impact

In this SNOPR, DOE proposes to amend the existing test procedure for ceiling fans by (1) including a definition for "circulating air" for the purpose of the ceiling fan definition; (2) expanding test procedure scope to include large-diameter ceiling fans with a diameter greater than 24 feet; (3) expanding the test procedure to high-speed belt-driven ceiling fans and large-diameter belt-driven ceiling fans; (4) including a provisions for measuring standby energy consumption for large-diameter ceiling fans; (5) amending the definition for low-speed; (6) allowing two-arm sensor setup; (7) requiring sensor arm to stabilize for 30 seconds prior to rotating sensor axes; (8) further specifying air velocity sensor mounting position; (9) providing instructions to measure blade thickness; (10) clarifying test procedures for ceiling fans with accessories; and (11) amending product-specific rounding and enforcement provisions for ceiling fans to reflect the most recent amendments to the test procedures and energy conservation standards for ceiling fans. Additionally, this SNOPR includes proposed regulatory text from the September 2019 NOPR: (1) specifying that VSD ceiling fans that do not also meet the definition of LSSD fan are not required to be tested pursuant to the DOE test method; (2) increasing the tolerance for the stability criteria for the average air velocity measurements for LSSD and VSD ceiling fans; (3) codifying in regulation existing guidance on the method for calculating several values reported on the Federal Trade Commission (FTC) EnergyGuide label using results from the ceiling fan test procedures in Appendix U to subpart B of 10 CFR part 430 and represented values in 10 CFR part 429; and (4) amending product-specific represented value, rounding and enforcement provisions. 84 FR 51440, 51442. DOE has tentatively determined that the test procedure as proposed in this September 2019 NOPR and as modified by this SNOPR will not be unduly burdensome for manufacturers to conduct.

Further discussion of the cost impacts of the test procedure amendments are presented in the following paragraphs.

a. Cost Impacts for Scope

As discussed in section III.A and III.B of this SNOPR, DOE is proposing to define "circulating air" to differentiate fans for "circulating air" (*i.e.*, ceiling fans) from other products that are not considered to be a ceiling fan for the purposes of the EPCA definition for ceiling fans, and include large-diameter ceiling fans greater than 24 feet in diameter.

Regarding DOE's proposal to include a definition for "circulating air," DOE identified that certain high-speed VSD ceiling fans with a diameter-to-maximum operating speed ratio less than 0.06 would be excluded from the ceiling fan scope. As discussed, VSD ceiling fans represent less than one percent of the total ceiling fan market. Furthermore, the segment of VSD ceiling fans that would be excluded from the ceiling fan scope would represent a portion of the less than one percent of the market. While the definition as proposed would likely result in a small cost savings for VSD ceiling fan manufacturers, DOE conservatively did not include these de minimis cost savings as part of the cost impact calculations.

Regarding including within the scope of the test procedure large-diameter ceiling fans greater than 24 feet in diameter, DOE is not aware of any large diameter ceiling fans greater than 24 feet commercially available on the market.

DOE requests comment on the number of ceiling fan models on the market that are larger than 24 feet, and the associated burden of testing any ceiling fans larger than 24 feet to the proposed DOE test procedure in this SNOPR.

b. Cost Impacts for New Belt-Driven Ceiling Fans

Based on DOE's review of literature of manufacturers who make HSBD and LDBD ceiling fans, DOE identified five manufacturers selling 17 ceiling fan models that are currently not covered by DOE's ceiling fan test procedure that would be covered by the proposed test procedure amendments, if finalized. Sixteen of these models fit the criteria for HSBD ceiling fans and one model fits the definition of LDBD ceiling fan. Four of these models are capable of variable speed operation while the remaining 13 are only capable of single speed operation. Based on third-party lab test cost quotes to test these belt-driven ceiling fans in accordance with AMCA 230-15, DOE estimates that it would cost manufacturers approximately $2,670 for a third-party to test one unit at high speed only and $3,165 to test one unit at both high speed and 40 percent speed. DOE requires at least two units be tested. Therefore, DOE estimates it would cost manufacturers approximately $5,340 per basic model capable of only single speed operation and $6,330 per basic model for multi-speed units. Therefore, DOE estimates that ceiling fan manufacturers would incur a one-time cost of approximately $94,740 to conduct testing for the proposed expanded scope of belt-driven ceiling fans.

DOE requests comment on the per model test cost estimate to test these expanded scope belt-driven ceiling fans, and the current estimate of the number of manufacturers and number of models of expanded scope belt-driven ceiling fans currently made by ceiling fan manufacturers.

c. Cost Impacts for Stability Criteria

This SNOPR includes regulatory text from the September 2019 NOPR proposing to increase the tolerance for the stability criteria for the average air velocity measurements of LSSD and VSD ceiling fans that meet the definition of LSSD ceiling fans at low speed. 84 FR 51440, 51446. DOE had identified cost savings that manufacturers would likely experience from avoiding the need to purchase additional and more-costly air velocity sensors to meet the stability criteria required by the current test procedure. 84 FR 51440, 51453-51454.

To test ceiling fans up to 84 inches in diameter with an air velocity sensor every 4 inches and in all four axes could require a manufacturer to purchase, calibrate, and install as many as 45 upgraded sensors. In this SNOPR, DOE estimates that this investment would be approximately $50,000 per manufacturer for these upgraded sensors. DOE estimated that at least two ceiling fan manufacturers have in-house testing facilities that would have had to invest in upgraded sensors to meet the stability criteria to comply with the current test procedure. Therefore, DOE estimates that the industry-wide one-time avoided cost due to this proposal would be approximately $100,000.

d. Cost Impacts for Low Speed Definition

As discussed in section III.D of this document, DOE is proposing to amend the low speed definition, which is required to test LSSD ceiling fans. DOE estimates that this proposal would require retesting a subset of LSSD ceiling fans. Based on DOE review of DOE's Compliance Certification Database ("CCD"), DOE identified 3,427 unique basic models of LSSD ceiling fans. Additionally, DOE estimated that there are 1,003 unique

basic models of LSSD ceiling fans with more than three speed settings. DOE conservatively estimates that approximately 10 percent of LSSD ceiling fans with more than three speed settings, 100 unique basic models, would be affected by the proposed low speed definition and would have to be retested in active mode using the proposed low speed definition, if finalized. Further, DOE estimates that the test procedure for LSSD ceiling fans will cost $1,500 on average per basic model active mode test. Therefore, DOE estimates that ceiling fan manufacturers would incur a one-time cost of approximately $150,000 to conduct retesting for the proposed low speed definition.

e. Cost Impacts for Other Test Procedure Amendments

DOE does not anticipate that the remainder of the amendments proposed in this SNOPR and the September 2019 NOPR would impact test costs.

The proposal to allow a two-arm sensor setup is in addition to the single-arm and four-arm setup already allowed in Appendix U. The proposal to require that the sensor arm to stabilize for an extra 30 seconds before moving axes should allow for more accurate air velocity measurements, resulting in less number of repetitions to meet the stability requirement in section 3.3.2 (1) of Appendix U. The proposals to specify air velocity sensor mounting position, measure blade thickness and testing for ceiling fans with accessories are clarifications.

DOE requests comment on the specific costs and cost savings identified regarding the proposed amendments to the scope, stability criteria, and low speed definition. Additionally, DOE requests comment on any other potential costs or costs savings not identified that ceiling fan manufacturers may incur as a result of the proposed test procedure amendments.

2. Harmonization with Industry Standards

DOE's established practice is to adopt relevant industry standards as DOE test procedures unless such methodology would be unduly burdensome to conduct or would not produce test results that reflect the energy efficiency, energy use, water use (as specified in EPCA) or estimated operating costs of that product during a representative average use cycle or period of use. Section 8(c) of appendix A of 10 CFR part 430 subpart C. In cases where the industry standard does not meet EPCA statutory criteria for test procedures, DOE will make modifications through the rulemaking process to these standards as the DOE test procedure.

The test procedures for ceiling fans at Appendix U incorporates by reference ANSI/AMCA 208-18, AMCA 230-15 and IEC 62301. ANSI/AMCA 208-18 provides the calculations to determine the CFEI for large-diameter ceiling fans. AMCA 230-15 provides the test methods to determine airflow (in CFM) and power consumption (in Watts), which are inputs to the CFEI metric described in AMCA 208-18. IEC 62301 provides the test method for measuring standby power for all ceiling fans. DOE is not proposing incorporating by reference any additional industry standards in this SNOPR. DOE requests comments on the benefits and burdens of the proposed updates and additions to industry standards referenced in the test procedure for ceiling fans.

DOE recognizes that adopting industry standards with modifications imposes a burden on industry *(i.e.,* manufacturers face increased costs if the DOE modifications require different testing equipment or facilities). DOE seeks comment on the degree to which the DOE test procedure should consider and be harmonized further with the most recent relevant industry standards for ceiling fans and whether there are any changes to

the Federal test method that would provide additional benefits to the public. DOE also requests comment on the benefits and burdens of, or any other comments regarding adopting any industry/voluntary consensus-based or other appropriate test procedure, without modification.

L. Compliance Date and Waivers

EPCA prescribes that, if DOE amends a test procedure, all representations of energy efficiency and energy use, including those made on marketing materials and product labels, must be made in accordance with that amended test procedure, beginning 180 days after publication of such a test procedure final rule in the *Federal Register*. (42 U.S.C. 6293(c)(2)) To the extent the modified test procedure proposed in this document is required only for the evaluation and issuance of updated efficiency standards, use of the modified test procedure, if finalized, would not be required until the implementation date of updated standards. Section 8(e) of appendix A 10 CFR part 430 subpart C.

If DOE were to publish an amended test procedure EPCA provides an allowance for individual manufacturers to petition DOE for an extension of the 180-day period if the manufacturer may experience undue hardship in meeting the deadline. (42 U.S.C. 6293(c)(3)) To receive such an extension, petitions must be filed with DOE no later than 60 days before the end of the 180-day period and must detail how the manufacturer will experience undue hardship. (*Id.*)

Upon the compliance date of test procedure provisions of an amended test procedure, should DOE issue a such an amendment, any waivers that had been previously issued and are in effect that pertain to issues addressed by such provisions are terminated. 10 CFR 430.27(h)(3). Recipients of any such waivers would be required to test the

products subject to the waiver according to the amended test procedure as of the compliance date of the amended test procedure. The amendments proposed in the September 2019 NOPR document pertain to issues addressed by a waiver granted to BAS, Case No. 2017-011. *See* 84 FR 51440, 51446.

IV. Procedural Issues and Regulatory Review

A. Review Under Executive Order 12866

The Office of Management and Budget ("OMB") has determined that this test procedure proposed rulemaking does not constitute "significant regulatory actions" under section 3(f) of Executive Order ("E.O.") 12866, Regulatory Planning and Review, 58 FR 51735 (Oct. 4, 1993). Accordingly, this action was not subject to review under the Executive order by the Office of Information and Regulatory Affairs ("OIRA") in OMB.

B. Review Under the Regulatory Flexibility Act

The Regulatory Flexibility Act (5 U.S.C. 601 *et seq.*) requires preparation of an initial regulatory flexibility analysis ("IRFA") for any rule that by law must be proposed for public comment, unless the agency certifies that the rule, if promulgated, will not have a significant economic impact on a substantial number of small entities. As required by Executive Order 13272, "Proper Consideration of Small Entities in Agency Rulemaking," 67 FR 53461 (August 16, 2002), DOE published procedures and policies on February 19, 2003, to ensure that the potential impacts of its rules on small entities are properly considered during the DOE rulemaking process. 68 FR 7990. DOE has made its procedures and policies available on the Office of the General Counsel's website: *https://energy.gov/gc/office-general-counsel*. DOE reviewed this proposed rule under the

provisions of the Regulatory Flexibility Act and the policies and procedures published on February 19, 2003.

The following sections detail DOE's IRFA for this test procedure SNOPR.

1. Description of Reasons Why Action is Being Considered

DOE is proposing to amend the existing DOE test procedures for ceiling fans. DOE shall amend test procedures with respect to any covered product, if the Secretary determines that amended test procedures would more accurately produce test results which measure energy efficiency, energy use, or estimated annual operating cost of a covered product during a representative average use cycle or period of use. (42 U.S.C. 6293(b)(1)(A))

2. Objective of, and Legal Basis for, Rule

DOE is required to review existing DOE test procedures for all covered products every 7 years. (42 U.S.C. 6293(b)(1)(A))

3. Description and Estimate of Small Entities Regulated

For manufacturers of ceiling fans, the Small Business Administration ("SBA") has set a size threshold, which defines those entities classified as "small businesses" for the purposes of the statute. DOE used the SBA's small business size standards to determine whether any small entities would be subject to the requirements of the rule. *See* 13 CFR part 121. The size standards are listed by North American Industry Classification System ("NAICS") code and industry description available at:

https://www.sba.gov/document/support--table-size-standards. Ceiling fan manufacturing is classified under NAICS code 335210, "Small Electrical Appliance Manufacturing." The SBA sets a threshold of 1,500 employees or less for an entity to be considered as a small business for this category.

To estimate the number of companies that manufacture ceiling fans covered by this rulemaking, DOE used data from DOE's publicly available Compliance Certification Database ("CCD"). DOE's small business search focused on companies that sell at least one LSSD ceiling fan model with more than three speed settings as well small businesses that sell HSBD or LDBD ceiling fans, since those are the only manufacturers, large or small, that are estimated to incur any costs due to the proposed test procedure amendments.

DOE identified 10 potential domestic small businesses that manufacture at least one LSSD ceiling fan with more than three speed settings. These 10 potential domestic small businesses sell approximately 325 unique LSSD ceiling fans with more than three speed settings. Additionally, DOE identified four potential domestic small businesses that manufacture HSBD or LDBD ceiling fans. These four potential domestic small businesses sell 15 known HSBD ceiling fan models and one known LDBD ceiling fan models.

4. Description and Estimate of Compliance Requirements

In this SNOPR, DOE proposes to amend the existing test procedure for ceiling fans by (1) including a definition for "circulating air" for the purpose of the ceiling fan definition; (2) expanding test procedure scope to include large-diameter ceiling fans with a diameter greater than 24 feet; (3) expanding the test procedure to HSBD ceiling fans

and LDBD ceiling fans; (4) including a standby metric for large-diameter ceiling fans; (5) amending the definition for low-speed; (6) allowing two-arm sensor setup; (7) requiring sensor arm to stabilize for 30 seconds prior to rotating sensor axes; (8) detailing air velocity sensor mounting position; (9) providing instructions to measure blade thickness; (10) clarifying test procedures for ceiling fans with accessories; and (11) amending certain product-specific rounding and enforcement provisions. Additionally, DOE continues to propose the following proposals from the September 2019 NOPR: (1) specifying that VSD ceiling fans that do not also meet the definition of LSSD fan are not required to be tested pursuant to the DOE test method; (2) increasing the tolerance for the stability criteria for the average air velocity measurements for LSSD ceiling fans; (3) codifying guidance for calculating several values reported on the FTC EnergyGuide label; and (4) amending other product-specific represented value, rounding and enforcement provisions.

DOE estimates that some ceiling fan manufacturers would experience a cost from the proposed test procedure amendment, if finalized, due to retesting specific LSSD ceiling fans at low speed. Additionally, DOE estimates that some ceiling fan manufacturers would experience a cost savings from the proposed test procedure amendment, if finalized, regarding the stability criteria for average air velocity measurements by not having to purchase sensors.

As stated in the previous section, DOE identified 10 potential domestic small businesses selling approximately 325 unique LSSD ceiling fans with more than three speed settings. DOE previously estimated that approximately 10 percent of LSSD ceiling fan models with more than three speed settings would be required to re-test their models using the proposed definition for low-speed. Therefore, DOE estimates that

approximately 33 ceiling fan models sold by domestic small businesses would need to be re-tested due to this proposed test procedure amendment. DOE previously estimated that it costs manufacturers approximately $1,500 for a third-party lab to conduct this test. Therefore, DOE estimates that all domestic small businesses would incur approximately $49,500 to re-test certain LSSD ceiling fans to the proposed low-speed definition. DOE estimates that the annual revenue of these 10 potential domestic small businesses that sell at least one LSSD ceiling fan with more than three speed settings range from approximately $1.7 million to over $250 million, with a median value of approximately $36 million.

Additionally, as stated in the previous section, DOE identified four potential domestic small businesses selling 15 HSBD ceiling fan models, four of which are capable of variable speed operation, and one LDBD ceiling fan models. DOE estimates that the test procedure for belt-driven ceiling fans would cost manufacturers approximately $5,340 per basic model capable of only single speed operation and $6,330 per basic model for multi-speed units to test in accordance to this proposed test procedure, if finalized. Therefore, DOE estimates that domestic small businesses would incur a one-time cost of approximately $89,400 to conduct testing for the proposed expanded scope of belt-driven ceiling fan. DOE estimates that the annual revenue of these four potential domestic small businesses that sell at least one HSBD or LDBD ceiling fan range from approximately $79,000 to $16 million.

DOE presents the estimated testing costs and annual revenue for each potential small business in Table IV.1.

Table IV.1 Estimated Testing Costs and Annual Revenue for Each Small Business

Company	Number of Belt-Driven Ceiling Fan Models	Estimated Testing Cost	Estimated Annual Revenue	Testing Costs as a Percent of Annual Revenue
Small Business 1	9	$48,060	$16,000,000	0.3%
Small Business 2	5	$28,680	$79,000	36.3%
Small Business 3	1	$6,330	$1,500,000	0.4%
Small Business 4	1	$6,330	$97,000	6.5%

DOE requests comment on the number of potential small businesses DOE identified; the number of ceiling fan models estimated to be manufactured by these potential small businesses; and the per-model testing costs DOE estimated small businesses may incur to test these identified ceiling fans. Additionally, DOE also requests comment on any other potential costs small businesses may incur due to the proposed amended test procedures, if finalized.

5. Duplication, Overlap, and Conflict with Other Rules and Regulations

DOE is not aware of any rules or regulations that duplicate, overlap, or conflict with the proposed rule being considered today.

6. Significant Alternatives to the Rule

As previously stated in this section, DOE is required to review existing DOE test procedures for all covered products every 7 years. Additionally, DOE shall amend test procedures with respect to any covered product, if the Secretary determines that amended test procedures would more accurately produce test results which measure energy efficiency, energy use, or estimated annual operating cost of a covered product during a representative average use cycle or period of use. (42 U.S.C. 6293(b)(1)(A)) DOE has

initially determined that the proposed test procedure amendments for ceiling fans would more accurately produce test results to measure the energy efficiency of ceiling fans.

While DOE recognizes that requiring that ceiling fan manufacturers to retest specific LSSD ceiling fans at low speed and expanding the scope of ceiling fans would cause manufacturers to re-test or test some ceiling fan models, the costs to re-test and test these models are inexpensive for most ceiling fan manufacturers. DOE has tentatively determined that there are no better alternatives than the proposed amended test procedures, in terms of both meeting the agency's objectives to accurately measure energy efficiency and reduce burden on manufacturers. Therefore, DOE is proposing to amend the existing DOE test procedure for ceiling fans, as proposed in this SNOPR.

Additional compliance flexibilities may be available through other means. EPCA provides that a manufacturer whose annual gross revenue from all of its operations does not exceed $8 million for the 12-month period preceding the date of the application may apply for an exemption from all or part of an energy conservation standard for a period not longer than 24 months after the effective date of a final rule establishing the standard. (42 U.S.C. 6295(t)) Additionally, manufacturers subject to DOE's energy efficiency standards may apply to DOE's Office of Hearings and Appeals for exception relief under certain circumstances. Manufacturers should refer to 10 CFR part 430, subpart E, and 10 CFR part 1003 for additional details on these additional compliance flexibilities.

C. Review Under the Paperwork Reduction Act of 1995

Manufacturers of ceiling fans must certify to DOE that their products comply with any applicable energy conservation standards. To certify compliance, manufacturers must first obtain test data for their products according to the DOE test procedures,

including any amendments adopted for those test procedures. DOE has established regulations for the certification and recordkeeping requirements for all covered consumer products and commercial equipment, including ceiling fans. (*See* generally 10 CFR part 429.) The collection-of-information requirement for the certification and recordkeeping is subject to review and approval by OMB under the Paperwork Reduction Act ("PRA"). DOE's current reporting requirements have been approved by OMB under OMB control number 1910-1400. Public reporting burden for the certification is estimated to average 35 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, certifying compliance, and completing and reviewing the collection of information.

Notwithstanding any other provision of the law, no person is required to respond to, nor shall any person be subject to a penalty for failure to comply with, a collection of information subject to the requirements of the PRA, unless that collection of information displays a currently valid OMB Control Number.

1. Description of the Requirements

In this SNOPR, DOE is proposing to expand the scope of the test procedure to include LDCFs with a diameter greater than 24 feet. If DOE amends the test procedures scope as proposed in this SNOPR, manufacturers of ceilings fans with a diameter greater than 24 feet will be required to certify compliance with energy conservation standards (in 10 CFR 430.32(s)(2)(ii)) beginning 180 days after publication of a test procedure final rule in the *Federal Register*. (42 U.S.C. 6293(c)(2)) DOE is proposing to revise the collection of information approval under OMB Control Number 1910-1400 to account for the paperwork burden associated with the expanded scope of LDCFs with a diameter

greater than 24 feet, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, certifying compliance, and completing and reviewing the collection of information.

2. Method of Collection

DOE is proposing that respondents must submit electronic forms using DOE's online Compliance Certification Management System ("CCMS"). DOE's CCMS is publicly accessible at *www.regulations.doe.gov/ccms*/, and includes instructions for users, registration forms, and the product-specific reporting templates required for use when submitting information to CCMS.

3. Data

The following are DOE estimates of the total annual reporting and recordkeeping burden imposed on manufacturers of LDCFs with a diameter greater than 24 feet subject to the amended certification reporting requirements in this proposed rule. DOE has reviewed the market for ceiling fans with a diameter greater than 24 feet and has identified 4 models currently being offered for sale by 2 manufacturers, both of which already certify compliance with the current energy conservation standards for ceiling fans. As a result of this market assessment, DOE did not find any new or additional respondents that would be required submit information as a result of the proposed expansion of scope for LDCFs.

The addition of four basic models to certification reports will simply expand their current CCMS excel templates by a row per basic model, which is trivial compared to the total number of ceiling fans they are already submitting.

OMB Control Number: 1910–1400.

Form Number: DOE F 220.7.

Type of Review: Regular submission.

Affected Public: Domestic manufacturers and importers of LDCFs with a diameter greater than 24 feet.

Estimated Number of Respondents: 0 (already submitting under current approval).

Estimated Time per Response: 0 (already submitting under current approval).

Estimated Total Annual Burden Hours: 0.

Estimated Total Annual Cost to the Manufacturers: $0 in recordkeeping/reporting costs.

4. Conclusion

DOE has tentatively determined that these proposed amendments would not impose additional costs for manufacturers of ceiling fans because manufacturers of these products or equipment are already submitting certification reports to DOE and should have readily available the information that DOE would collect if the proposed expansion of scope is finalized as part of this rulemaking. Public comment is sought on the number of respondents and burden requirements for collecting information for LDCFs with a diameter greater than 24 feet. Send comments on these or any other aspects of the

collection of information to the email address listed in the **ADDRESSES** section and to the OMB Desk Officer by email to *Sofie.E.Miller@omp.eop.gov*.

D. Review Under the National Environmental Policy Act of 1969

DOE is analyzing this proposed regulation in accordance with the National Environmental Policy Act of 1969 ("NEPA") and DOE's NEPA implementing regulations (10 CFR part 1021). DOE's regulations include a categorical exclusion for rulemakings interpreting or amending an existing rule or regulation that does not change the environmental effect of the rule or regulation being amended. 10 CFR part 1021, subpart D, appendix A5. DOE anticipates that this rulemaking qualifies for categorical exclusion A5 because it is an interpretive rulemaking that does not change the environmental effect of the rule and otherwise meets the requirements for application of a categorical exclusion. *See* 10 CFR 1021.410. DOE will complete its NEPA review before issuing the final rule.

E. Review Under Executive Order 13132

Executive Order 13132, "Federalism," 64 FR 43255 (Aug. 4, 1999) imposes certain requirements on agencies formulating and implementing policies or regulations that preempt State law or that have federalism implications. The Executive order requires agencies to examine the constitutional and statutory authority supporting any action that would limit the policymaking discretion of the States and to carefully assess the necessity for such actions. The Executive order also requires agencies to have an accountable process to ensure meaningful and timely input by State and local officials in the

development of regulatory policies that have federalism implications. On March 14, 2000, DOE published a statement of policy describing the intergovernmental consultation process it will follow in the development of such regulations. 65 FR 13735. DOE has examined this proposed rule and has determined that it would not have a substantial direct effect on the States, on the relationship between the national government and the States, or on the distribution of power and responsibilities among the various levels of government. EPCA governs and prescribes Federal preemption of State regulations as to energy conservation for the products that are the subject of this proposed rule. States can petition DOE for exemption from such preemption to the extent, and based on criteria, set forth in EPCA. (42 U.S.C. 6297(d)) No further action is required by Executive Order 13132.

F. Review Under Executive Order 12988

Regarding the review of existing regulations and the promulgation of new regulations, section 3(a) of Executive Order 12988, "Civil Justice Reform," 61 FR 4729 (Feb. 7, 1996), imposes on Federal agencies the general duty to adhere to the following requirements: (1) eliminate drafting errors and ambiguity, (2) write regulations to minimize litigation, (3) provide a clear legal standard for affected conduct rather than a general standard, and (4) promote simplification and burden reduction. Section 3(b) of Executive Order 12988 specifically requires that executive agencies make every reasonable effort to ensure that the regulation (1) clearly specifies the preemptive effect, if any, (2) clearly specifies any effect on existing Federal law or regulation, (3) provides a clear legal standard for affected conduct while promoting simplification and burden reduction, (4) specifies the retroactive effect, if any, (5) adequately defines key terms, and (6) addresses other important issues affecting clarity and general draftsmanship under

any guidelines issued by the Attorney General. Section 3(c) of Executive Order 12988 requires executive agencies to review regulations in light of applicable standards in sections 3(a) and 3(b) to determine whether they are met or it is unreasonable to meet one or more of them. DOE has completed the required review and determined that, to the extent permitted by law, the proposed rule meets the relevant standards of Executive Order 12988.

G. Review Under the Unfunded Mandates Reform Act of 1995

Title II of the Unfunded Mandates Reform Act of 1995 ("UMRA") requires each Federal agency to assess the effects of Federal regulatory actions on State, local, and Tribal governments and the private sector. Pub. L. 104-4, sec. 201 (codified at 2 U.S.C. 1531). For a proposed regulatory action likely to result in a rule that may cause the expenditure by State, local, and Tribal governments, in the aggregate, or by the private sector of $100 million or more in any one year (adjusted annually for inflation), section 202 of UMRA requires a Federal agency to publish a written statement that estimates the resulting costs, benefits, and other effects on the national economy. (2 U.S.C. 1532(a), (b)) The UMRA also requires a Federal agency to develop an effective process to permit timely input by elected officers of State, local, and Tribal governments on a proposed "significant intergovernmental mandate," and requires an agency plan for giving notice and opportunity for timely input to potentially affected small governments before establishing any requirements that might significantly or uniquely affect small governments. On March 18, 1997, DOE published a statement of policy on its process for intergovernmental consultation under UMRA. 62 FR 12820; also available at *https://energy.gov/gc/office-general-counsel*. DOE examined this proposed rule according to UMRA and its statement of policy and determined that the rule contains

neither an intergovernmental mandate, nor a mandate that may result in the expenditure of $100 million or more in any year, so these requirements do not apply.

H. Review Under the Treasury and General Government Appropriations Act, 1999

Section 654 of the Treasury and General Government Appropriations Act, 1999 (Pub. L. 105-277) requires Federal agencies to issue a Family Policymaking Assessment for any rule that may affect family well-being. This proposed rule would not have any impact on the autonomy or integrity of the family as an institution. Accordingly, DOE has concluded that it is not necessary to prepare a Family Policymaking Assessment.

I. Review Under Treasury and General Government Appropriations Act, 2001

Section 515 of the Treasury and General Government Appropriations Act, 2001 (44 U.S.C. 3516 note) provides for agencies to review most disseminations of information to the public under guidelines established by each agency pursuant to general guidelines issued by OMB. OMB's guidelines were published at 67 FR 8452 (Feb. 22, 2002), and DOE's guidelines were published at 67 FR 62446 (Oct. 7, 2002). DOE has reviewed this proposed rule under the OMB and DOE guidelines and has concluded that it is consistent with applicable policies in those guidelines.

J. Review Under Executive Order 12630

DOE has determined, under Executive Order 12630, "Governmental Actions and Interference with Constitutionally Protected Property Rights" 53 FR 8859 (March 18,

1988), that this proposed regulation would not result in any takings that might require compensation under the Fifth Amendment to the U.S. Constitution.

K. Review Under Executive Order 13211

Executive Order 13211, "Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use," 66 FR 28355 (May 22, 2001), requires Federal agencies to prepare and submit to OMB, a Statement of Energy Effects for any proposed significant energy action. A "significant energy action" is defined as any action by an agency that promulgated or is expected to lead to promulgation of a final rule, and that (1) is a significant regulatory action under Executive Order 12866, or any successor order; and (2) is likely to have a significant adverse effect on the supply, distribution, or use of energy; or (3) is designated by the Administrator of OIRA as a significant energy action. For any proposed significant energy action, the agency must give a detailed statement of any adverse effects on energy supply, distribution, or use should the proposal be implemented, and of reasonable alternatives to the action and their expected benefits on energy supply, distribution, and use.

The proposed regulatory action to amend the test procedure for measuring the energy efficiency of ceiling fans is not a significant regulatory action under Executive Order 12866. Moreover, it would not have a significant adverse effect on the supply, distribution, or use of energy, nor has it been designated as a significant energy action by the Administrator of OIRA. Therefore, it is not a significant energy action, and accordingly, DOE has not prepared a Statement of Energy Effects.

L. Review Under Section 32 of the Federal Energy Administration Act of 1974

Under section 301 of the Department of Energy Organization Act (Pub. L. 95–91; 42 U.S.C. 7101), DOE must comply with section 32 of the Federal Energy Administration Act of 1974, as amended by the Federal Energy Administration Authorization Act of 1977. (15 U.S.C. 788; "FEAA") Section 32 essentially provides in relevant part that, where a proposed rule authorizes or requires use of commercial standards, the notice of proposed rulemaking must inform the public of the use and background of such standards. In addition, section 32(c) requires DOE to consult with the Attorney General and the Chairman of the Federal Trade Commission ("FTC") concerning the impact of the commercial or industry standards on competition.

DOE is not proposing any new incorporations by reference of commercial standards in this SNOPR. The proposed modifications to the test procedure for ceiling fans would not incorporate any new testing methods.

M. Description of Materials Incorporated by Reference

The Director of the Federal Register previously approved the following standards from the Air Movement and Control Association International, Inc. (AMCA), for incorporation by reference into appendix U to subpart B: ANSI/AMCA Standard 208-18, ("AMCA 208-18"), Calculation of the Fan Energy Index, and ANSI/AMCA Standard 230-15 ("AMCA 230-15"), "Laboratory Methods of Testing Air Circulating Fans for Rating and Certification."

V. Public Participation

A. Participation in the Webinar

The time and date of the webinar are listed in the **DATES** section at the beginning of this document. If no participants register for the webinar, it will be cancelled. Webinar registration information, participant instructions, and information about the capabilities available to webinar participants will be published on DOE's website: *www1.eere.energy.gov/buildings/appliance_standards/standards.aspx?productid=5*. Participants are responsible for ensuring their systems are compatible with the webinar software.

B. Submission of Comments

DOE will accept comments, data, and information regarding this proposed rule no later than the date provided in the **DATES** section at the beginning of this proposed rule. Interested parties may submit comments using any of the methods described in the **ADDRESSES** section at the beginning of this document.

Submitting comments via www.regulations.gov. The *www.regulations.gov* web page will require you to provide your name and contact information. Your contact information will be viewable to DOE Building Technologies staff only. Your contact information will not be publicly viewable except for your first and last names, organization name (if any), and submitter representative name (if any). If your comment is not processed properly because of technical difficulties, DOE will use this information to contact you. If DOE cannot read your comment due to technical difficulties and cannot contact you for clarification, DOE may not be able to consider your comment.

However, your contact information will be publicly viewable if you include it in the comment or in any documents attached to your comment. Any information that you

do not want to be publicly viewable should not be included in your comment, nor in any document attached to your comment. Persons viewing comments will see only first and last names, organization names, correspondence containing comments, and any documents submitted with the comments.

Do not submit to *www.regulations.gov* information for which disclosure is restricted by statute, such as trade secrets and commercial or financial information (hereinafter referred to as Confidential Business Information ("CBI")). Comments submitted through *www.regulations.gov* cannot be claimed as CBI. Comments received through the website will waive any CBI claims for the information submitted. For information on submitting CBI, see the Confidential Business Information section.

DOE processes submissions made through *www.regulations.gov* before posting. Normally, comments will be posted within a few days of being submitted. However, if large volumes of comments are being processed simultaneously, your comment may not be viewable for up to several weeks. Please keep the comment tracking number that *www.regulations.gov* provides after you have successfully uploaded your comment.

Submitting comments via email. Comments and documents submitted via email will be posted to *www.regulations.gov*. If you do not want your personal contact information to be publicly viewable, do not include it in your comment or any accompanying documents. Instead, provide your contact information on a cover letter. Include your first and last names, email address, telephone number, and optional mailing address. The cover letter will not be publicly viewable as long as it does not include any comments

Include contact information each time you submit comments, data, documents, and other information to DOE. No telefacsimiles (faxes) will be accepted.

Comments, data, and other information submitted to DOE electronically should be provided in PDF (preferred), Microsoft Word or Excel, WordPerfect, or text (ASCII) file format. Provide documents that are not secured, written in English and free of any defects or viruses. Documents should not contain special characters or any form of encryption and, if possible, they should carry the electronic signature of the author.

Campaign form letters. Please submit campaign form letters by the originating organization in batches of between 50 to 500 form letters per PDF or as one form letter with a list of supporters' names compiled into one or more PDFs. This reduces comment processing and posting time.

Confidential Business Information. Pursuant to 10 CFR 1004.11, any person submitting information that he or she believes to be confidential and exempt by law from public disclosure should submit via email, postal mail, or hand delivery/courier two well-marked copies: one copy of the document marked confidential including all the information believed to be confidential, and one copy of the document marked non-confidential with the information believed to be confidential deleted. Submit these documents via email or on a CD, if feasible. DOE will make its own determination about the confidential status of the information and treat it according to its determination.

It is DOE's policy that all comments may be included in the public docket, without change and as received, including any personal information provided in the comments (except information deemed to be exempt from public disclosure).

C. Issues on Which DOE Seeks Comment

Although DOE welcomes comments on any aspect of this proposal, DOE is particularly interested in receiving comments and views of interested parties concerning the following issues:

1) DOE seeks comment on the proposed definition of "circulating air" for the purpose of the ceiling fan definition. Specifically, DOE requests comment on the use of a "diameter-to-maximum operating speed" ratio to distinguish fans with circulating airflow from directional airflow, and the appropriateness of using 0.06 in/RPM as the threshold ratio. If another ratio should be considered, DOE requests additional data to corroborate that ratio.
2) DOE seeks comment on the characterization of fans that would fall below the 0.06 in/RPM threshold ratio, such as certain high-speed VSD ceiling fans that do not also meet the definition of an LSSD fan. Specifically, DOE request comment on the appropriateness of excluding high-speed VSD ceiling fans from scope of "ceiling fans."
3) DOE seeks comment regarding whether "circulating air" should be defined within the definition of ceiling fan at 10 CFR 430.2, as DOE has proposed, or if "circulating air" should be defined separately within appendix U.
4) DOE seeks comment on its proposal to remove the 24-foot blade span limit in section 3.4.1 of appendix U, which would expand the scope of the test procedure for LDCFs to ceiling fans with blade span larger than 24 feet.
5) DOE seeks comment on including within the test procedure scope HSBD ceiling fans, the proposed term and definition, and the appropriate tip speed threshold. Furthermore, DOE requests data on blade thickness and tip speeds for these HSBD ceiling fans.

6) DOE seeks comment on the alternate definition for HSBD ceiling fans, and whether it would incorporate all the LDBD ceiling fans from DOE's primary proposal. Further, DOE requests comment on whether the HSBD and LDBD ceiling fan scope should be combined, i.e., what is the utility and application of the two fan categories.

7) DOE requests comment on requiring AMCA 230-15 as the test procedure for HSBD and LDBD ceiling fans, or whether DOE should consider any other test procedure.

8) DOE requests comment on its proposal to test single speed HSBD and LDBD only at high speed and variable speed HSBD and LDBD at high speed and 40 percent speed. Alternatively, DOE requests comment the typical number of operating speeds and hours for HSBD ceiling fans and LDBD ceiling fans.

9) DOE requests comment on whether the efficiency of HDBD fans and LDBD ceiling fans is more appropriately evaluated using the CFEI or CFM/W metric.

10) DOE seeks comment on its preliminary determination that establishing an integrated metric that incorporates the energy efficiency measured as required under each LCDF standard and the energy use measured during standby mode would be technically infeasible.

11) DOE seeks comment on its proposal to specify for LDCFs a separate standby mode energy use metric, which would be based on the standby power procedure defined in section 3.6 of appendix U.

12) DOE seeks comment on its proposal to specify for HSBD ceiling fans and LDBD ceiling fans a separate standby mode energy use metric, which would be based on the standby power procedure defined in section 3.6 of appendix U.

13) DOE seeks comment on the proposal to update the low speed definition as follows: Low speed means the lowest available ceiling fan speed for which fewer than half or three, whichever is fewer, sensors per individual axis are measuring less than 40 feet per minute.

14) DOE also seeks comment on the alternate proposal to represent low speed as a table specifying the number of sensors per individual axis required to measure greater than 40 feet per minute.

15) DOE seeks comment on the proposal to require testing to start at the lowest speed and move to the next highest speed until the modified low speed criteria are met. Specifically, DOE seeks comment on whether any applicable variable speed LSSD ceiling fans (without distinct speed settings) would require further specificity on this proposal and if so, how it should be specified.

16) DOE requests comment on the extent to which, for DOE certification purposes, an individual unit within a sample of fans (per basic model) could have a different setting that meets the proposed definition of low speed than other units within the same sample. If so, DOE requests data on how the issue could affect representativeness (in terms of ceiling fan efficiency) of the basic model.

17) DOE seeks comment on the proposed requirement to add 30 seconds between test runs for a rotating arm setup (either single-arm or two-arm).

18) DOE seeks comment on its proposal to permit the use of a two-arm setup, as well as any data to confirm that a 2-arm option produces comparable results to the existing 1-arm and 4-arm options.

19) DOE requests comment on its proposal to specify aligning the air velocity sensors perpendicular to the airflow. DOE also requests comment on whether it should revise Figure 2 of appendix U, and/or provide an additional figure, to depict more clearly the alignment of the velocity sensors perpendicular to the direction of airflow.

20) DOE seeks comment on its proposal to measure ceiling fan blade thickness at the thickest point within 1” of the blade’s leading edge, along the plane perpendicular to the blade’s radial length at which the blade is thinnest. Specifically, DOE seeks feedback on if this update will prevent ceiling fans from being incorrectly classified

into the wrong product class. DOE also welcomes feedback on if the blade thickness should be measured within 1" of the leading edge, or if the allowable thickness measurement zone should be restricted to closer to the leading edge (e.g., within ½" or ¼" of the leading edge).

21) DOE seeks comment on its proposal to require that testing be performed without any additional accessories or features energized, if possible; and if not, with the additional accessories or features set at the lowest energy-consuming mode for testing.

22) DOE seeks comment on its proposal to specify that any represented value of airflow (CFM) at high speed, including the value used to determine whether a ceiling fan is a highly-decorative ceiling fan, is determined pursuant to 10 CFR 429.32(a)(2)(i) and rounded to the nearest CFM.

23) DOE requests comment on the proposed instrument measurement resolution, rounding and tolerance requirements for blade edge thickness measurements.

24) DOE seeks comment on its proposal to define a tolerance of 2% for blade RPM measurements at high speed. If other tolerances are recommended, DOE seeks specific equipment and/or voltage variation data to justify the recommended tolerance.

25) DOE requests comment on the number of ceiling fan models on the market that are larger than 24 feet, and the associated burden of testing any ceiling fans larger than 24 feet to the proposed DOE test procedure in this SNOPR.

26) DOE requests comment on the per model test cost estimate to test these expanded scope belt-driven ceiling fans, and the current estimate of the number of manufacturers and number of models of expanded scope belt-driven ceiling fans currently made by ceiling fan manufacturers.

27) DOE requests comment on the specific costs and cost savings identified regarding the proposed amendments to the scope, stability criteria, and low speed definition. Additionally, DOE requests comment on any other potential costs or costs savings not

identified that ceiling fan manufacturers may incur as a result of the proposed test procedure amendments.

28) DOE requests comment on the number of potential small businesses DOE identified; the number of ceiling fan models estimated to be manufactured by these potential small businesses; and the per-model testing costs DOE estimated small businesses may incur to test these identified ceiling fans. Additionally, DOE also requests comment on any other potential costs small businesses may incur due to the proposed amended test procedures, if finalized.

29) DOE requests comment on the number of respondents and burden requirements for collecting information for LDCFs with a diameter greater than 24 feet.

VI. Approval of the Office of the Secretary

The Secretary of Energy has approved publication of this supplemental notice of proposed rulemaking.

List of Subjects

10 CFR Part 429

Administrative practice and procedure, Confidential business information, Energy conservation, Household appliances, Reporting and recordkeeping requirements.

10 CFR Part 430

Administrative practice and procedure, Confidential business information, Energy conservation, Household appliances, Imports, Incorporation by reference, Intergovernmental relations, Small businesses.

Signing Authority

This document of the Department of Energy was signed on November 16, 2021, by Kelly Speakes-Backman, Principal Deputy Assistant Secretary and Acting Assistant Secretary for Energy Efficiency and Renewable Energy, pursuant to delegated authority from the Secretary of Energy. That document with the original signature and date is maintained by DOE. For administrative purposes only, and in compliance with requirements of the Office of the Federal Register, the undersigned DOE Federal Register Liaison Officer has been authorized to sign and submit the document in electronic format for publication, as an official document of the Department of Energy. This administrative process in no way alters the legal effect of this document upon publication in the *Federal Register*.

Signed in Washington, DC, on November 17, 2021

_____

Treena V. Garrett
Federal Register Liaison Officer,
U.S. Department of Energy

For the reasons stated in the preamble, DOE proposes to amend parts 429 and 430 of chapter II of title 10, Code of Federal Regulations as set forth below:

PART 429—CERTIFICATION, COMPLIANCE, AND ENFORCEMENT FOR CONSUMER PRODUCTS AND COMMERCIAL AND INDUSTRIAL EQUIPMENT

1. The authority citation for part 429 continues to read as follows:

   Authority: 42 U.S.C. 6291-6317; 28 U.S.C. 2461 note.

2. Section 429.32 is amended by:

   a. Revising the introductory text in paragraph (a)(2);

   b. Revising paragraph (a)(2)(ii)(B); and

   c. Adding paragraphs (a)(3) and (4);

   The revisions and additions read as follows:

§429.32 Ceiling fans.

(a) * * *

(2) For each basic model of ceiling fan, a sample of sufficient size must be randomly selected and tested to ensure that—

* * * * *

(ii) * * *

(B) The upper 95 percent confidence limit (UCL) of the true mean divided by 1.1, where:

$$UCL = \bar{x} + t_{0.95}(\frac{s}{\sqrt{n}})$$

And $\bar{x}$ is the sample mean; s is the sample standard deviation; n is the number of samples; and $t_{0.95}$ is the t statistic for a 95% one-tailed confidence interval with n-1 degrees of freedom (from appendix A to this subpart); and

(3) For each basic model of ceiling fan,

(i) Any represented value of blade span, as defined in section 1.4 of appendix U to subpart B of part 430, is the mean of the blade spans measured for the sample selected as described in paragraph (a)(1) of this section, rounded to the nearest inch; and

(ii) Any represented value of blade revolutions per minute (RPM) is the mean of the blade RPM measurements measured for the sample selected as described in paragraph (a)(1) of this section, rounded to the nearest RPM; and

(iii) Any represented value of blade edge thickness is the mean of the blade edge thicknesses measured for the sample selected as described in paragraph (a)(1) of this section, rounded to the nearest 0.01 inch; and

(iv) Any represented value of the distance between the ceiling and the lowest point on the fan blades is the mean of the distances measured for the sample selected as described in paragraph (a)(1) of this section, rounded to the nearest quarter of an inch; and

(v) Any represented value of tip speed is pi multiplied by represented value of blade span divided by twelve multiplied by the represented value of RPM, rounded to the nearest foot per minute;

(vi) Any represented value of airflow (CFM) at high speed, including the value used to determine whether a ceiling fan is a highly-decorative ceiling fan as defined in section 1.9 of appendix U to subpart B of part 430, is determined pursuant to paragraph (a)(2)(i) and rounded to the nearest CFM; and

(4) To determine values required by the Federal Trade Commission (FTC), use the following provisions. Note that, for multi-mount ceiling fans these values must be reported on the EnergyGuide label for the ceiling fan configuration with the lowest efficiency.

(i) FTC Airflow. Determine the represented value for FTC airflow by calculating the weighted-average airflow of an LSSD or VSD ceiling fan basic model at low and high fan speed as follows:

$$Airflow_{FTC} = \frac{CFM_{Low} \times 3.0 \ + \ CFM_{High} \times 3.4}{6.4}$$

Where:

$Airflow_{FTC}$ = represented value for FTC airflow, rounded to the nearest CFM,

CFM_{Low} = represented value of measured airflow, in cubic feet per minute, at low fan speed, pursuant to paragraph (a)(2)(i) of this section, and

CFM_{High} = represented value of measured airflow, in cubic feet per minute, at high fan speed, pursuant to paragraph (a)(2)(i) of this section.

(ii) FTC Energy Use. Determine represented value for FTC energy use by calculating the weighted-average power consumption of an LSSD or VSD ceiling fan basic model at low and high fan speed as follows:

$$Energy\ Use_{FTC} = \frac{W_{Low} \times 3.0\ +\ W_{High} \times 3.4 +\ W_{Sb} \times 17.6}{6.4}$$

Where:

$Energy\ Use_{FTC}$ = represented value for FTC Energy Use, rounded to the nearest watt,

W_{Low} = represented value of measured power consumption, in watts, at low fan speed, pursuant to paragraph (a)(2)(ii) of this section,

W_{High} = represented value of measured power consumption, in watts, at high fan speed, pursuant to paragraph (a)(2)(ii) of this section, and

W_{Sb} = represented value of measured power consumption, in watts, in standby mode, pursuant to paragraph (a)(2)(ii) of this section.

(iii) FTC Estimated Yearly Energy Cost. Determine the represented value for FTC estimated yearly energy cost of an LSSD or VSD ceiling fan basic model at low and high fan speed as follows:

$$EYEC_{FTC} = \frac{W_{Low} \times 3.0\ +\ W_{High} \times 3.4 +\ W_{Sb} \times 17.6}{1000} \times 365 \times 0.12$$

Where:

$EYEC_{FTC}$ = represented value for FTC estimated yearly energy cost, rounded to the nearest dollar, and

W_{Low} = represented value of measured power consumption, in watts, at low fan speed, pursuant to paragraph (a)(2)(ii) of this section,

W_{High} = represented value of measured power consumption, in watts, at high fan speed, pursuant to paragraph (a)(2)(ii) of this section, and

W_{Sb} = represented value of measured power consumption, in watts, in standby mode, pursuant to paragraph (a)(2)(ii) of this section.

* * * * *

3. Section 429.134 is amended by adding paragraph (s) to read as follows:

§429.134 Product-specific enforcement provisions.

* * * * *

(s) *Ceiling Fans*--(1) *Verification of blade span.* DOE will measure the blade span and round the measurement pursuant to the test requirements of 10 CFR part 430 of this chapter for each unit tested. DOE will consider the represented blade span valid only if the rounded measurement(s) (either the rounded measured value for a single unit, or the mean of the rounded measured values for a multiple unit sample, rounded to the nearest inch) is the same as the represented blade span.

(i) If DOE determines that the represented blade span is valid, that blade span will be used as the basis for determining the product class and calculating the minimum allowable ceiling fan efficiency.

(ii) If DOE determines that the represented blade span is invalid, DOE will use the rounded measured blade span(s) as the basis for determining the product class, and calculating the minimum allowable ceiling fan efficiency.

(2) *Verification of the distance between the ceiling and lowest point of fan blades.* DOE will measure the distance between the ceiling and lowest point of the fan blades and round the measurement pursuant to the test requirements of 10 CFR part 430 of this chapter for each unit tested. DOE will consider the represented distance valid only if the rounded measurement(s) (either the measured value for a single unit, or the mean of the

measured values for a multiple unit sample, rounded to the nearest quarter inch) are the same as the represented distance.

(i) If DOE determines that the represented distance is valid, that distance will be used as the basis for determining the product class.

(ii) If DOE determines that the represented distance is invalid, DOE will use the rounded measured distance(s) as the basis for determining the product class.

(3) *Verification of blade revolutions per minute (RPM) measured at high speed.* DOE will measure the blade RPM at high speed pursuant to the test requirements of 10 CFR part 430 of this chapter for each unit tested. DOE will consider the represented blade RPM measured at high speed valid only if the measurement(s) (either the measured value for a single unit, or the mean of the measured values for a multiple unit sample, rounded to the nearest RPM) are within the greater of 2% of the represented blade RPM at high speed.

(i) If DOE determines that the represented RPM is valid, that RPM will be used as the basis for determining the product class.

(ii) If DOE determines that the represented RPM is invalid, DOE will use the rounded measured RPM(s) as the basis for determining the product class.

(4) *Verification of blade edge thickness.* DOE will measure the blade edge thickness and round the measurement pursuant to the test requirements of 10 CFR part 430 for each unit tested. DOE will consider the represented blade edge thickness valid only if the measurement(s) (either the measured value for a single unit, or the mean of the

measured values for a multiple unit sample, rounded to the nearest 0.01 inch) are the same as the represented blade edge thickness.

(i) If DOE determines that the represented blade edge thickness is valid, that blade edge thickness will be used for determining product class.

(ii) If DOE determines that the represented blade edge thickness is invalid, DOE will use the rounded measured blade edge thickness(es) as the basis for determining the product class.

PART 430--ENERGY CONSERVATION PROGRAM FOR CONSUMER PRODUCTS

4. The authority citation for part 430 continues to read as follows:

   Authority: 42 U.S.C. 6291–6309; 28 U.S.C. 2461 note.

5. Section 430.2 is amended by revising the definition of "Ceiling fan" to read as follows:

§430.2 Definitions.

* * * * *

Ceiling fan means a nonportable device that is suspended from a ceiling for circulating air via the rotation of fan blades. For the purpose of this definition:

(1) Circulating Air means the discharge of air in an upward or downward direction with the air returning to the intake side of the fan. A ceiling fan that has a ratio of fan blade span (in inches) to maximum rotation rate (in revolutions per minute) greater than 0.06 provides circulating air.

(2) For all other ceiling fan related definitions, see appendix U to this subpart.

* * * * *

6. Section 430.23 is amended by revising paragraph (w) to read as follows:

§430.23 Test procedures for the measurement of energy and water consumption.

* * * * *

(w) *Ceiling fans*. Measure the following attributes of a single ceiling fan in accordance with appendix U to this subpart: airflow; power consumption; ceiling fan efficiency; ceiling fan energy index (CFEI); standby power; distance between the ceiling and lowest point of fan blades; blade span; blade edge thickness; and blade revolutions per minute (RPM).

* * * * *

7. Appendix U to subpart B of part 430 is amended by:

a. Revising the introductory text;

b. Revising sections 1.4, and 1.8 through 1.20;

c. Adding sections 1.21 and 1.22;

d. Revising sections 2, 3, 3.2.2(1), 3.2.2(4), 3.2.2(6), 3.2.3, 3.3.1(3), 3.3.1(4), 3.3.1(8), and 3.3.2;

e. Adding section 3.3.3;

f. Revising section 3.4;

g. Removing section 3.4.1, and redesignating sections 3.4.2 through 3.4.4, as sections 3.4.1 through 3.4.3;

h. Revising sections 3.5, 3.5.1, 3.6.(1), 4, and 5;

The revisions and additions read as follows:

Appendix U to Subpart B of Part 430—Uniform Test Method for Measuring the Energy Consumption of Ceiling Fans

Prior to [*effective date of test procedure final rule*], manufacturers must make any representations with respect to the energy use or efficiency of ceiling fans as specified in Section 2 of this appendix as it appeared on January 23, 2017. On or after [*effective date of test procedure final rule*], manufacturers of ceiling fans, as specified in section 2 of this appendix, must make any representations with respect to energy use or efficiency in accordance with the results of testing pursuant to this appendix. Certification of standby power consumption for large-diameter ceiling fans is required from the time that an energy conservation standard on standby power consumption requires compliance.

1. * * *

1.4. *Blade span* means the diameter of the largest circle swept by any part of the fan blade assembly, including attachments. The represented value of blade span (D) is as determined in 10 CFR 429.32.

* * * * *

1.8. *High-speed small-diameter (HSSD) ceiling fan* means a small-diameter ceiling fan that is not a very-small-diameter ceiling fan, highly-decorative ceiling fan or belt-driven ceiling fan and that has a represented value of blade edge thickness, as determined in 10 CFR 429.32(a)(3)(iii), of less than 3.2 mm or a maximum represented value of tip speed, as determined in 10 CFR 429.32(a)(3)(v), greater than the applicable limit specified in the table in this definition.

High-Speed Small-Diameter Ceiling Fan Blade and Tip Speed Criteria		
Airflow	**Thickness (t) of Edges of**	**Tip Speed Threshold**

Direction	Blades			
	Mm	Inch	m/s	feet per minute
Downward-only	4.8 > t ≥ 3.2	3/16 > t ≥ 1/8	16.3	3,200
Downward-only	t ≥ 4.8	t ≥ 3/16	20.3	4,000
Reversible	4.8 > t ≥ 3.2	3/16 > t ≥ 1/8	12.2	2,400
Reversible	t ≥ 4.8	t ≥ 3/16	16.3	3,200

1.9. *High-speed belt-driven (HSBD) ceiling fan* means a small-diameter ceiling fan that is a belt-driven ceiling fan with one fan head, and has tip speeds greater than or equal to 5000 feet per minute.

1.10. *Highly-decorative ceiling fan* means a ceiling fan with a maximum represented value of blade revolutions per minute (RPM), as determined in 10 CFR 429.32(a)(3)(ii), of 90 RPM, and a represented value of airflow at high speed, as determined in 10 CFR 429.32(a)(3)(vi), of less than 1,840 CFM.

1.11. *Hugger ceiling fan* means a low-speed small-diameter ceiling fan that is not a very-small-diameter ceiling fan, highly-decorative ceiling fan, or belt-driven ceiling fan, and for which the represented value of the distance between the ceiling and the lowest point on the fan blades, as determined in 10 CFR 429.32(a)(3)(iv), is less than or equal to 10 inches.

1.12. *Large-diameter ceiling fan* means a ceiling fan that is not a highly-decorative ceiling fan or belt-driven ceiling fan and has a represented value of blade span, as determined in 10 CFR 429.32(a)(3)(i), greater than seven feet.

1.13. *Large-diameter belt-driven (LDBD) ceiling fan* means a belt-driven ceiling fan with one fan head that has a represented value of blade span, as determined in 10 CFR 429.32(a)(3)(i), greater than seven feet.

1.14. *Low speed* means the lowest available ceiling fan speed for which fewer than half or three, whichever is fewer, sensors per individual axis are measuring less than 40 feet per minute.

1.15. *Low-speed small-diameter (LSSD) ceiling fan* means a small-diameter ceiling fan that has a represented value of blade edge thickness, as determined in 10 CFR 429.32(a)(3)(iii), greater than or equal to 3.2 mm and a maximum represented value of tip speed, as determined in 10 CFR 429.32(a)(3)(v), less than or equal to the applicable limit specified in the table in this definition.

Low-Speed Small-Diameter Ceiling Fan Blade and Tip Speed Criteria				
Airflow Direction	**Thickness (t) of Edges of Blades**		**Tip Speed Threshold**	
	Mm	**Inch**	**m/s**	**feet per minute**
Reversible	$4.8 > t \geq 3.2$	$3/16 > t \geq 1/8$	12.2	2,400
Reversible	$t \geq 4.8$	$t \geq 3/16$	16.3	3,200

1.16. *Multi-head ceiling fan* means a ceiling fan with more than one fan head, *i.e.,* more than one set of rotating fan blades.

1.17. *Multi-mount ceiling fan* means a low-speed small-diameter ceiling fan that can be mounted in the configurations associated with both the standard and hugger ceiling fans.

1.18. *Oscillating ceiling fan* means a ceiling fan containing one or more fan heads for which the axis of rotation of the fan blades cannot remain in a fixed position relative to the ceiling. Such fans have no inherent means by which to disable the oscillating function separate from the fan blade rotation.

1.19. *Small-diameter ceiling fan* means a ceiling fan that has a represented value of blade span, as determined in 10 CFR 429.32(a)(3)(i), less than or equal to seven feet.

1.20. *Standard ceiling fan* means a low-speed small-diameter ceiling fan that is not a very-small-diameter ceiling fan, highly-decorative ceiling fan or belt-driven ceiling fan, and for which the represented value of the distance between the ceiling and the lowest point on the fan blades, as determined in 10 CFR 429.32(a)(3)(iv), is greater than 10 inches.

1.21. *Total airflow* means the sum of the product of airflow and hours of operation at all tested speeds. For multi-head fans, this includes the airflow from all fan heads.

1.22. *Very-small-diameter (VSD) ceiling fan* means a small-diameter ceiling fan that is not a highly-decorative ceiling fan or belt-driven ceiling fan; and has one or more fan heads, each of which has a represented value of blade span, as determined in 10 CFR 429.32(a)(3)(i), of 18 inches or less. Only VSD fans that also meet the definition of an LSSD fan are required to be tested for purposes of determining compliance with energy efficiency standards established by DOE and for other representations of energy efficiency.

2. Scope:

The provisions in this appendix apply to ceiling fans except:

(1) Ceiling fans where the plane of rotation of a ceiling fan's blades is not less than or equal to 45 degrees from horizontal, or cannot be adjusted based on the manufacturer's specifications to be less than or equal to 45 degrees from horizontal;

(2) Centrifugal ceiling fans;

(3) Belt-driven ceiling fans that are not either a high-speed belt-driven ceiling fan or a large-diameter belt-driven ceiling fan; and

(4) Oscillating ceiling fans.

3. *General Instructions, Test Apparatus, and Test Measurement:*

The test apparatus and test measurement used to determine energy performance depend on the ceiling fan's blade span, and in some cases the ceiling fan's blade edge thickness. For each tested ceiling fan, measure the lateral distance from the center of the axis of rotation of the fan blades to the furthest fan blade edge from the center of the axis of rotation. Measure this lateral distance at the resolution of the measurement instrument, using an instrument with a measurement resolution of least 0.25 inches. Multiply the lateral distance by two and then round to the nearest whole inch to determine the blade span. For ceiling fans having a blade span greater than 18 inches and less than or equal to 84 inches, measure the ceiling fan's blade edge thickness. To measure the fan blade edge thickness, use an instrument with a measurement resolution of at least 0.001 inch and measure the thickness of one fan blade's leading edge (in the forward direction) according to the following:

(1) Locate the cross section perpendicular to the fan blade's radial length that is at least one inch from the tip of the fan blade and for which the blade is thinnest, and

(2) Measure at the thickest point of that cross section within one inch from the leading edge of the fan blade.

See Figure 1 of this appendix for an instructional schematic on the fan blade edge thickness measurement. Figure 1 depicts a ceiling fan from above. Round the measured blade edge thickness to the nearest 0.01 inch.

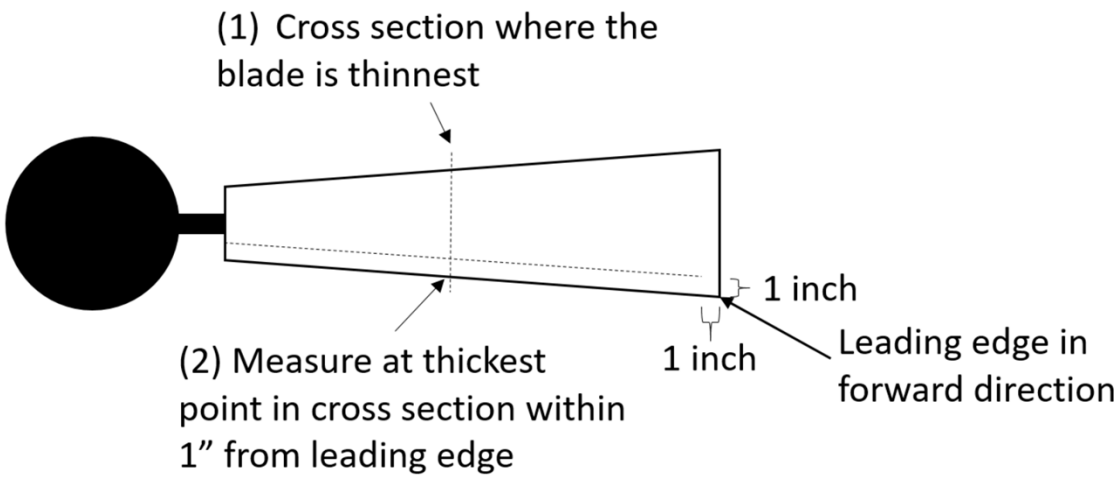

Figure 1 to Appendix U to Subpart B of Part 430: Measurement Criteria for Fan Blade Edge Thickness

* * * * *

3.2.2. *Equipment Set-up*.

(1) Make sure the transformer power is off. Hang the ceiling fan to be tested directly from the ceiling, according to the manufacturer's installation instructions. Hang all non-multi-mount ceiling fans in the fan configuration that minimizes the distance between the ceiling and the lowest point of the fan blades. Hang and test multi-mount fans in two configurations: The configuration associated the definition of a standard fan that minimizes the distance between the ceiling and the lowest point of the fan blades and the configuration associated with the definition of a hugger fan that minimizes the distance between the ceiling and the lowest point of the fan blades. For all tested configurations, measure the distance between the ceiling and the lowest point of the fan blade using an

instrument with a measurement resolution of at least 0.25 inches. Round the measured distance from the ceiling to the lowest point of the fan blade to the nearest quarter inch.

* * * * *

(4) A single rotating sensor arm, two rotating sensor arms, or four fixed sensor arms can be used to take air velocity measurements along four axes, labeled A-D. Axes A, B, C, and D are at 0, 90, 180, and 270 degree positions. Axes A-D must be perpendicular to the four walls of the room. See Figure 2 of this appendix.

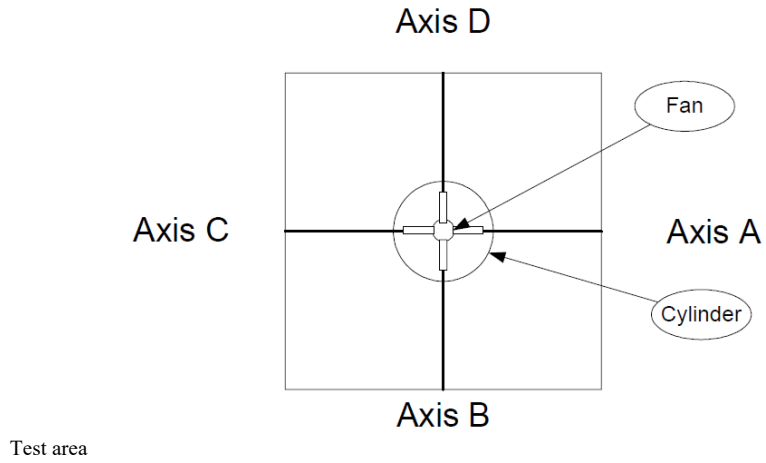

Figure 2 to Appendix U to Subpart B of Part 430: Testing Room and Sensor Arm Axes

* * * * *

(6) Place the sensors at intervals of 4 ± 0.0625 inches along a sensor arm, starting with the first sensor at the point where the four axes intersect, aligning the sensors perpendicular to the direction of airflow. Do not touch the actual sensor prior to testing. Use enough sensors to record air delivery within a circle 8 inches larger in diameter than the blade span of the ceiling fan being tested. The experimental set-up is shown in Figure 3 of this appendix.

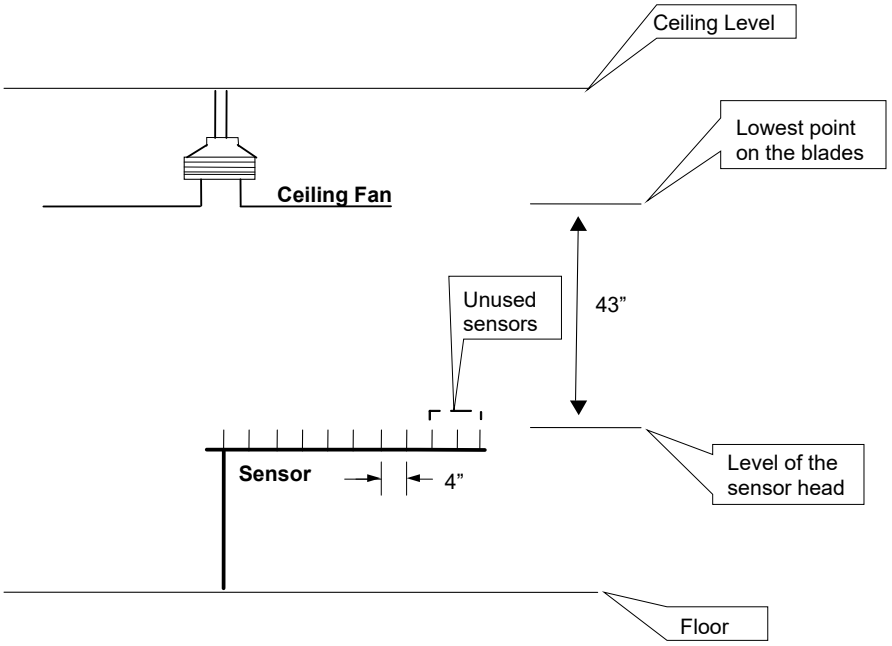

Figure 3 to Appendix U to Subpart B of Part 430: Air Delivery Room Set-Up for Small-Diameter Ceiling Fans other than High-Speed Belt-Driven Ceiling Fans

* * * * *

3.2.3. *Multi-Head Ceiling Fan Test Set-Up.*

Hang a multi-headed ceiling fan from the ceiling such that one of the ceiling fan heads is centered directly over sensor 1 (i.e., at the intersection of axes A, B, C, and D). The distance between the lowest point any of the fan blades of the centered fan head can reach and the air velocity sensors is to be such that it is the same as for all other small-diameter ceiling fans (see Figure 3 of this appendix). If the multi-head ceiling fan has an oscillating function (i.e., the fan heads change their axis of rotation relative to the ceiling) that can be switched off, switch it off prior to taking air velocity measurements. If any multi-head fan does not come with the blades preinstalled, install fan blades only on the fan head that will be directly centered over the intersection of the sensor axes. (Even if the fan heads in a multi-head ceiling fan would typically oscillate when the blades are

installed on all fan heads, the ceiling fan is subject to this test procedure if the centered fan head does not oscillate when it is the only fan head with the blades installed.) If the fan blades are preinstalled on all fan heads, measure air velocity in accordance with section 3.3 of this appendix except turn on only the centered fan head. Take the power consumption measurements separately, with the fan blades installed on all fan heads and with any oscillating function, if present, switched on.

* * * * *

3.3.1 *Test conditions to be followed when testing*:

* * * * *

(3) If present, any additional accessories or features sold with the ceiling fan that do not relate to the ceiling fan's ability to create airflow by rotation of the fan blades (for example light kit, heater, air ionization, ultraviolet technology) is to be installed but turned off during testing. If the accessory/feature cannot be turned off, it shall be set to the lowest energy-consuming mode during testing.

(4) If present, turn off any oscillating function causing the axis of rotation of the fan head(s) to change relative to the ceiling during operation prior to taking air velocity measurements. Turn on any oscillating function prior to taking power measurements.

* * * * *

(8) Measure power input at a point that includes all power-consuming components of the ceiling fan (but without any attached light kit energized; or without any additional accessory or feature energized, if possible; and if not, with the additional accessory or feature set at the lowest energy-consuming mode).

* * * * *

3.3.2 *Air Velocity and Power Consumption Testing Procedure:*

Measure the air velocity (FPM) and power consumption (W) for HSSD ceiling fans until stable measurements are achieved, measuring at high speed only. Measure the air velocity and power consumption for LSSD and VSD ceiling fans that also meet the definition of an LSSD fan until stable measurements are achieved, measuring first at low speed and then at high speed. To determine low speed, start measurements at the lowest available speed and move to the next highest speed until the low speed definition in section 1.12 of this appendix is met. Air velocity and power consumption measurements are considered stable for high speed if:

(1) The average air velocity for each sensor varies by less than 5% or 2 FPM, whichever is greater, compared to the average air velocity measured for that same sensor in a successive set of air velocity measurements, and

(2) Average power consumption varies by less than 1% in a successive set of power consumption measurements.

(a) Air velocity and power consumption measurements are considered stable for low speed if:

(1) The average air velocity for each sensor varies by less than 10% or 2 FPM, whichever is greater, compared to the average air velocity measured for that same sensor in a successive set of air velocity measurements, and

(2) Average power consumption varies by less than 1% in a successive set of power consumption measurements.

(b) These stability criteria are applied differently to ceiling fans with airflow not directly downward. See section 3.3.3 of this appendix.

Step 1: Set the first sensor arm (if using four fixed arms), two sensor arm (if using a two-arm rotating setup), or single sensor arm (if using a single-arm rotating setup) to the 0 degree Position (Axis A). If necessary, use a marking as reference. If using a single-arm rotating setup or two-arm rotating setup, adjust the sensor arm alignment until it is at the 0 degree position by remotely controlling the antenna rotator.

Step 2: Set software up to read and record air velocity, expressed in feet per minute (FPM) in 1 second intervals. (Temperature does not need to be recorded in 1 second intervals.) Record current barometric pressure.

Step 3: Allow test fan to run 15 minutes at rated voltage and at high speed if the ceiling fan is an HSSD ceiling fan. If the ceiling fan is an LSSD or VSD ceiling fan that also meets the definition of an LSSD fan, allow the test fan to run 15 minutes at the rated voltage and at the lowest available ceiling fan speed. Turn off all forced-air environmental conditioning equipment entering the chamber (e.g., air conditioning), close all doors and vents, and wait an additional 3 minutes prior to starting test session.

Step 4a: For a rotating sensor arm: Begin recording readings. Starting with Axis A, take 100 air velocity readings (100 seconds run-time) and record these data. For all fans except multi-head fans and fans capable of oscillating, also measure power during the interval that air velocity measurements are taken. Record the average value of the air velocity readings for each sensor in feet per minute (FPM). Determine if the readings meet the low speed definition as defined in section 1.12 of this appendix. If not, restart Step 4a at the next highest speed until the low-speed definition is met. Once the low

speed definition is met, rotate the arm, stabilize the arm, and allow 30 seconds to allow the arm to stop oscillating. Repeat data recording and rotation process for Axes B, C, and D. Step 4a is complete when the readings for all axes meet the low speed definition at the same speed. Save the data for all axes only for those measurements that meet the low speed definition. Using the measurements applicable to low speed, record the average value of the power measurement in watts (W) (400 readings). Record the average value of the air velocity readings for each sensor in feet per minute (FPM) (400 readings).

Step 4b: For a two-arm rotating setup: Begin recording readings. Starting with Axes A and C, take 100 air velocity readings (100 seconds run-time) for both axes and record these data. For all fans except multi-head fans and fans capable of oscillating, also measure power during the interval that air velocity measurements are taken. Record the average value of the air velocity readings for each sensor in feet per minute (FPM). Determine if the readings meet the low speed definition as defined in section 1.12 of this appendix. If not, restart Step 4b at the next highest speed until the low speed definition is met. Once the low speed definition is met, rotate the two-arm, stabilize the arm, and allow 30 seconds to allow the arm to stop oscillating. Repeat data recording for Axes B and D. Step 4b is complete when the readings for all axes meet the low speed definition at the same speed. Save the data for all axes only for those measurements that meet the low speed definition. Using the measurements applicable to low speed, record the average value of the power measurement in watts (W) (200 readings). Record the average value of the air velocity readings for each sensor in feet per minute (FPM) (200 readings).

Step 4c: For four fixed sensor arms: Begin recording readings. Take 100 air velocity readings (100 seconds run-time) and record this data. Take the readings for all sensor arms (Axes A, B, C, and D) simultaneously. For all fans except multi-head fans and fans capable of oscillating, also measure power during the interval that air velocity

measurements are taken. Record the average value of the air velocity readings for each sensor in feet per minute (FPM). Determine if the readings meet the low speed definition as defined in section 1.12 of this appendix. If not, restart Step 4c at the next highest speed until the low speed definition is met. Step 4c is complete when the readings for all axes meet the low speed definition at the same speed. Save the data for all axes only for those measurements that meet the low speed definition. Using the measurements applicable to low speed, record the average value of the power measurement in watts (W) (100 readings). Record the average value of the air velocity readings for each sensor in feet per minute (FPM) (100 readings).

Step 5: Repeat step 4a, 4b or 4c until stable measurements are achieved.

Step 6: Repeat steps 1 through 5 above on high speed for LSSD and VSD ceiling fans that also meet the definition of an LSSD fan. Note: Ensure that temperature and humidity readings are maintained within the required tolerances for the duration of the test (all tested speeds). Forced-air environmental conditioning equipment may be used and doors and vents may be opened between test sessions to maintain environmental conditions.

Step 7: If testing a multi-mount ceiling fan, repeat steps 1 through 6 with the ceiling fan in the ceiling fan configuration (associated with either hugger or standard ceiling fans) not already tested.

If a multi-head ceiling fan includes more than one category of ceiling fan head, then test at least one of each unique category. A fan head with different construction that could affect air movement or power consumption, such as housing, blade pitch, or motor, would constitute a different category of fan head.

Step 8: For multi-head ceiling fans, measure active (real) power consumption in all phases simultaneously at each speed continuously for 100 seconds with all fan heads turned on, and record the average value at each speed in watts (W).

For ceiling fans with an oscillating function, measure active (real) power consumption in all phases simultaneously at each speed continuously for 100 seconds with the oscillating function turned on. Record the average value of the power measurement in watts (W).

For both multi-head ceiling fans and fans with an oscillating function, repeat power consumption measurement until stable power measurements are achieved.

3.3.3 *Air Velocity Measurements for Ceiling Fans with Airflow Not Directly Downward*:

Using the number of sensors that cover the same diameter as if the airflow were directly downward, record air velocity at each speed from the same number of continuous sensors with the largest air velocity measurements. This continuous set of sensors must be along the axis that the ceiling fan tilt is directed in (and along the axis that is 180 degrees from the first axis). For example, a 42-inch fan tilted toward axis A may create the pattern of air velocity shown in Figure 4 of this appendix. As shown in Table 1 of this appendix, a 42-inch fan would normally require 7 active sensors per axis. However, because the fan is not directed downward, all sensors must record data. In this case, because the set of sensors corresponding to maximum air velocity are centered 3 sensor positions away from the sensor 1 along the A axis, substitute the air velocity at A axis sensor 4 for the average air velocity at sensor 1. Take the average of the air velocity at A axis sensors 3 and 5 as a substitute for the average air velocity at sensor 2, take the average of the air

velocity at A axis sensors 2 and 6 as a substitute for the average air velocity at sensor 3, etc. Lastly, take the average of the air velocities at A axis sensor 10 and C axis sensor 4 as a substitute for the average air velocity at sensor 7. Stability criteria apply after these substitutions. For example, air velocity stability at sensor 7 are determined based on the average of average air velocity at A axis sensor 10 and C axis sensor 4 in successive measurements. Any air velocity measurements made along the B-D axis are not included in the calculation of average air velocity.

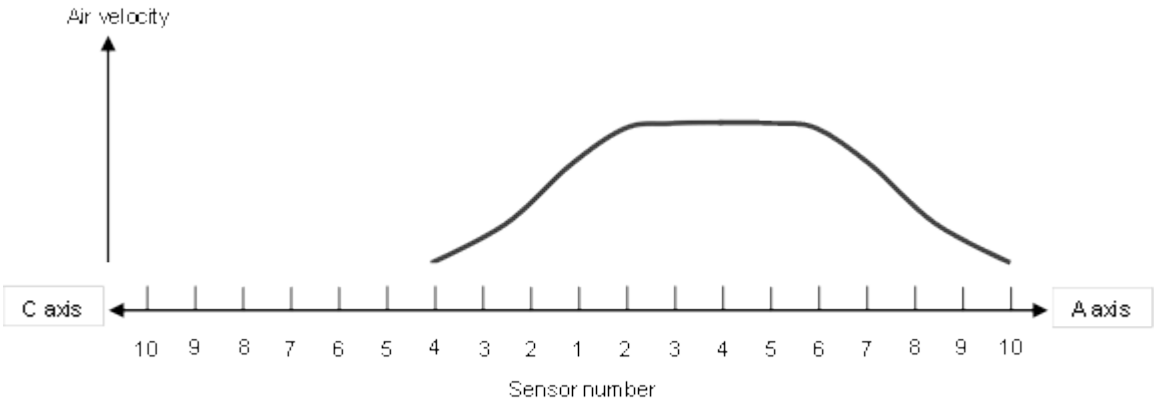

Figure 4 to Appendix U to Subpart B of Part 430: Example Air Velocity Pattern for Airflow Not Directly Downward

3.4 Test apparatus for large-diameter ceiling fans, high-speed belt-driven ceiling fans and large-diameter belt-driven ceiling fans:

The test apparatus and instructions for testing large-diameter ceiling fans, HSBD and LDBD ceiling fans must conform to the requirements specified in sections 3 through 7 of AMCA 230-15 (incorporated by reference, see §430.3), with the following modifications:

* * * * *

3.5 Active mode test measurement for large-diameter ceiling fans, high-speed belt-driven ceiling fans and large-diameter belt-driven ceiling fans:

(1) Test large-diameter ceiling fans in accordance with AMCA 208-18 (incorporated by reference, see §430.3), in all phases simultaneously at:

(a) High speed, and

(b) 40 percent or the nearest speed that is not less than 40 percent speed.

(2) Test high-speed belt-driven ceiling fans and large-diameter belt-driven ceiling fans in accordance with AMCA 208-18, in all phases simultaneously at:

(a) High speed, and

(b) 40 percent or the nearest speed that is not less than 40 percent speed, if the fan is capable of multi-speed operation.

(3) When testing at 40 percent speed for large-diameter ceiling fans that can operate over an infinite number of speeds (*e.g.,* ceiling fans with VFDs), ensure the average measured RPM is within the greater of 1% of the average RPM at high speed or 1 RPM. For example, if the average measured RPM at high speed is 50 RPM, for testing at 40% speed, the average measured RPM should be between 19 RPM and 21 RPM. If the average measured RPM falls outside of this tolerance, adjust the ceiling fan speed and repeat the test. Calculate the airflow and measure the active (real) power consumption in all phases simultaneously in accordance with the test requirements specified in sections 8 and 9, AMCA 230-15, with the following modifications:

3.5.1 Measure active (real) power consumption in all phases simultaneously at a point that includes all power-consuming components of the ceiling fan. If present, any additional accessories or features sold with the ceiling fan that do not relate to the ceiling fan's ability to create airflow by rotation of the fan blades (for example light kit, heater, air ionization, ultraviolet technology) are to be installed but turned off during testing. If

the accessory/feature cannot be turned off, it shall be set to the lowest energy-consuming mode during testing.

* * * * *

3.6 Test measurement for standby power consumption.

(1) * * *

(a) The ability to facilitate the activation or deactivation of other functions (including active mode) by remote switch (including remote control), internal sensor, or timer.

(b) Continuous functions, including information or status displays (including clocks), or sensor-based functions.

* * * * *

4. Calculation of Ceiling Fan Efficiency From the Test Results:

4.1 Calculation of effective area for small-diameter ceiling fans other than high-speed belt-driven ceiling fans:

Calculate the effective area corresponding to each sensor used in the test method for small-diameter ceiling fans other than high-speed belt-driven ceiling fans (section 3.3 of this appendix) with the following equations:

(1) For sensor 1, the sensor located directly underneath the center of the ceiling fan, the effective width of the circle is 2 inches, and the effective area is:

$$\boldsymbol{Effective\ Area\ (sq.\ ft.) = \pi\left(\frac{2}{12}\right)^2 = 0.0873} \qquad \textbf{Eq. 1}$$

(2) For the sensors between sensor 1 and the last sensor used in the measurement, the effective area has a width of 4 inches. If a sensor is a distance *d,* in inches, from sensor 1, then the effective area is:

$$\boldsymbol{Effective\ Area\ (sq.ft.)} = \boldsymbol{\pi\left(\frac{d+2}{12}\right)^2 - \pi\left(\frac{d-2}{12}\right)^2} \qquad \textbf{Eq. 2}$$

(3) For the last sensor, the width of the effective area depends on the horizontal displacement between the last sensor and the point on the ceiling fan blades furthest radially from the center of the fan. The total area included in an airflow calculation is the area of a circle 8 inches larger in diameter than the ceiling fan blade span (as specified in section 3 of this appendix).

Therefore, for example, for a 42-inch ceiling fan, the last sensor is 3 inches beyond the end of the ceiling fan blades. Because only the area within 4 inches of the end of the ceiling fan blades is included in the airflow calculation, the effective width of the circle corresponding to the last sensor would be 3 inches. The calculation for the effective area corresponding to the last sensor would then be:

$$\boldsymbol{Effective\ Area\ (sq.ft.)} = \boldsymbol{\pi\left(\frac{d+1}{12}\right)^2 - \pi\left(\frac{d-2}{12}\right)^2 = \pi\left(\frac{24+1}{12}\right)^2 - \pi\left(\frac{24-2}{12}\right)^2 = 3.076} \qquad \textbf{Eq. 3}$$

For a 46-inch ceiling fan, the effective area of the last sensor would have a width of 5 inches, and the effective area would be:

$$\boldsymbol{Effective\ Area\ (sq.ft.)} = \boldsymbol{\pi\left(\frac{d+3}{12}\right)^2 - \pi\left(\frac{d-2}{12}\right)^2 = \pi\left(\frac{24+3}{12}\right)^2 - \pi\left(\frac{24-2}{12}\right)^2 = 5.345} \qquad \textbf{Eq. 4}$$

4.2 Calculation of airflow and efficiency for small-diameter ceiling fans other than high-speed belt-driven ceiling fans:

Calculate fan airflow using the overall average of both sets of air velocity measurements at each sensor position from the successive sets of measurements that meet the stability

criteria from section 3.3 of this appendix. To calculate airflow for HSSD, LSSD, and VSD ceiling fans, multiply the overall average air velocity at each sensor position from section 3.3 (for high speed for HSSD, LSSD, and VSD ceiling fans that also meet the definition of an LSSD ceiling fan; and repeated for low speed only for LSSD and VSD ceiling fans that also meet the definition of an LSSD ceiling fan) by that sensor's effective area (see section 4.1 of this appendix), and then sum the products to obtain the overall calculated airflow at the tested speed.

For each speed, using the overall calculated airflow and the overall average power consumption measurements from the successive sets of measurements as follows:

$$\boldsymbol{Ceiling\ Fan\ Efficiency\ (CFM/W)} = \frac{\sum_i (\boldsymbol{CFM_i \times OH_i})}{\boldsymbol{W_{Sb} \times OH_{Sb}} + \sum_i (\boldsymbol{W_i \times OH_i})} \qquad \textbf{Eq. 5}$$

Where:

CFM_i = airflow at speed *i*,

OH_i = operating hours at speed *i*, as specified in Table 2 of this appendix,

W_i = power consumption at speed *i*,

OH_{Sb} = operating hours in standby mode, as specified in Table 2 of this appendix, and

W_{Sb} = power consumption in standby mode.

Calculate two ceiling fan efficiencies for multi-mount ceiling fans: One efficiency corresponds to the ceiling fan mounted in the configuration associated with the definition of a hugger ceiling fan, and the other efficiency corresponds to the ceiling fan mounted in the configuration associated with the definition of a standard ceiling fan.

Table 2 to Appendix U to Subpart B of Part 430: Daily Operating Hours for Calculating Ceiling Fan Efficiency

Daily Operating Hours for LSSD and VSD* Ceiling Fans		
	No Standby	With Standby
High Speed	3.4	3.4
Low Speed	3.0	3.0
Standby Mode	0.0	17.6
Off Mode	17.6	0.0
Daily Operating Hours for HSSD Ceiling Fans		
	No Standby	With Standby
High Speed	12.0	12.0
Standby Mode	0.0	12.0
Off Mode	12.0	0.0

* These values apply only to VSD fans that also meet the definition of an LSSD fan.

4.3 Calculation of airflow and efficiency for multi-head ceiling fans:

Calculate airflow for each fan head using the method described in section 4.2 of this appendix. To calculate overall airflow at a given speed for a multi-head ceiling fan, sum the airflow for each fan head included in the ceiling fan (a single airflow can be applied to each of the identical fan heads, but at least one of each unique fan head must be tested). The power consumption is the measured power consumption with all fan heads on. Using the airflow as described in this section, and power consumption measurements from section 3.3 of this appendix, calculate ceiling fan efficiency for a multi-head ceiling fan as follows:

$$\boldsymbol{Ceiling\ Fan\ Efficiency\ (CFM/W)} = \frac{\sum_i (\boldsymbol{CFM_i \times OH_i})}{\boldsymbol{W_{Sb} \times OH_{Sb}} + \sum_i (\boldsymbol{W_i \times OH_i})} \qquad \textbf{Eq. 6}$$

Where:

CFM_i = sum of airflows for each head at speed i,

OH_i = operating hours at speed i as specified in Table 2 of this appendix,

W_i = power consumption at speed i,

OH_{Sb} = operating hours in standby mode as specified in Table 2 of this appendix, and

W_{Sb} = power consumption in standby mode.

5. *Calculation of Ceiling Fan Energy Index (CFEI) From the Test Results for Large Diameter Ceiling Fans, High-Speed Belt-Driven Ceiling Fans, and Large-Diameter Belt-Driven Ceiling Fans*:

Calculate CFEI, which is the FEI for large-diameter ceiling fans, high-speed belt-driven ceiling fans, and large-diameter belt-driven ceiling fans, at the speeds specified in section 3.5 of this appendix according to ANSI/AMCA 208-18, with the following modifications:

(1) Using an Airflow Constant (Q0) of 26,500 cubic feet per minute;

(2) Using a Pressure Constant (P0) of 0.0027 inches water gauge; and

(3) Using a Fan Efficiency Constant ($\eta 0$) of 42 percent.

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